Vol 1 of 2 6050

U.S. Army Environmental Center

*Final*

# Expanded Site Inspection Report

## Pedricktown Support Facility
## Salem County, New Jersey

**December 21, 1993**

**Prepared for:**

**Commander**
**Department of the Army**
**U.S. Army Environmental Center**
**Aberdeen Proving Ground, MD 21010-5401**

**USAEC Contract No. DAAA15-90-D-0014**
**Delivery Order DA 14**

**Volume 1 of 2**

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**Prepared by:**

**Versar Inc.**
**2010 Cabot Boulevard West**
**Langhorne, PA 19047-1811**



AEC Form 45, 1 Feb 93 replaces THAMA Form 45 which is obsolete.

Final

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VERSAR, INC.
2010 Cabot Boulevard West
Langhorne, PA 19047-1811

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## TABLES
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## APPENDICES

## EXECUTIVE SUMMARY

Versar, Inc. (Versar) conducted an Expanded Site Inspection (ESI) at the Pedricktown Support Facility in Oldmans Township, Salem County, New Jersey. The field portion of this investigation was conducted from June to September 1993. All work was performed under contract DAAA15-90-D-0014 with the U.S. Army Environmental Center.

The ESI involved sitewide hydrogeological characterization of the 127-acre facility and contiguous U.S. Army Corps of Engineers (ACOE) properties, and multi-media sampling and analysis from a variety of areas of concern (AOCs) and solid waste management units (SWMUs). AOCs and SWMUs included areas with large concentrations of underground storage tanks (USTs), a former scrap metal storage area, a motor pool, a paint shop, ordnance disassembly buildings, and a former incinerator and leaching pool area near the present sewage treatment plant.

A total of 19 groundwater monitoring wells and 3 piezometers were installed for hydrogeological and water quality characterization at the site. The monitoring wells were located based on preliminary hydrogeological data obtained from the piezometers and several keys wells, the geographic locations of the AOCs and SWMUs, aerial photo reconnaissance, and soil gas survey data. Site hydrogeological characterization indicated an exceptionally high water table in the Cape May aquifer, with a northwesterly direction of groundwater flow attaining velocities as high as 0.71 feet per day.

During the ESI, samples of various media were obtained from soil borings, monitoring wells, stormwater catch basins, and drainage swales. A thorough assessment of the core AOCs and SMWUs at the site revealed no significant soil or groundwater contamination; thus HRS scoring (9.63) did not support the inclusion of PSF on the National Priority List (NPL).

In conjunction with the ESI, a preliminary risk assessment was performed. Data comparisons in the risk assessment utilized the conservative approach of assuming future residential land use scenarios and soil ingestion by children as the most significant exposure pathway.

ESI conclusions and recommendations center around the development and implementation of a site-wide UST closure and upgrading program, catch basin sediment removal and subsequent resampling of sediment and surface water in the northern

drainage swale, soil sampling and evaluation at 3 transformer locations, and resampling of the groundwater from selected wells in conjunction with the UST closure program.

## 1.0 INTRODUCTION

Versar, Inc. (Versar) completed an Expanded Site Inspection (ESI) for the United States Army Environmental Center (USAEC) at the Pedricktown Support Facility (PSF), Salem County, New Jersey. Versar followed the steps and procedures outlined in the ESI Project Plan, dated May 19, 1993. The PSF ESI is intended to evaluate the potential environmental impacts associated with past site operations as well as to determine, through Hazard Ranking System (HRS) scoring, whether the site should be considered for inclusion on the National Priority List (NPL).

### 1.1 Site Background

The PSF site consists of 127 acres located in northwestern Oldmans Township, Salem County, New Jersey. The site is adjacent to the Pedricktown Dredged Materials Storage Areas, North and South, which are diked areas used for storage of dredged sediments from the Delaware River. Both the PSF site and these storage areas are part of the Sievers-Sandberg U.S. Army Reserve Center. Located adjacent and west of the PSF site, the Penns Grove Project Area consists primarily of a large man-made lake that occupies approximately 240 acres of the total 335-acre site. Like Pedricktown North and South, this area was originally intended for the storage of dredged materials, but was never used for that purpose. The PSF site is therefore bounded to the north, east, and west by the storage areas and to the southeast by U.S. Route 130. Immediately west of the storage areas lies the Delaware River. Across Route 130 to the southeast are rural farmlands. A general site location map is presented in Figure 1.1.

In 1917, the U.S. Army Corps of Engineers (ACOE) began to acquire property along the Delaware River. These properties were locally owned farms, including a farm once owned by former New Jersey State Senator, William Styles. In 1918, the current PSF site was used to establish the Delaware Ordnance Depot, which remained in operation until 1958 as the final assembly and storage point for munitions prior to off-site shipment. During World War II, the site specialized in the manufacture of Pentolite based munitions, including grenades and rockets. In 1947, the site became the back-up storage facility for the Picatinny and Frankford Arsenals and the Aberdeen Proving Grounds. Jurisdiction over the site was transferred to the Chief Engineer of the ACOE for civil works purposes in May 1959. In 1960, the PSF became headquarters for the 42nd and 43rd Artillery, which commanded the Nike missile sites in the Philadelphia area. A NORAD Command Center was built on the site, and this group remained on site until 1965, when

the buildings were turned over to the Salem County Technical Institute. With the arrival of the 21st Corps, 79th Army Reserve Command in the late 1960s, the Salem County Technical Institute moved to a new location. In 1974, the 21st Corps was replaced by the 78th Division of the Army Reserve. This group currently remains stationed at the PSF. An eastern portion of the site is currently leased to Salem County Community College.

### 1.1.1 Previous Environmental Investigations

A Preliminary Assessment (PA) of the PSF site was conducted by RMC Environmental Services in April 1991. The PA consisted of an aerial photo and regulatory records review, a site walk-through inspection, soil gas surveys in two areas of concern, a limited wetlands delineation, and a limited endangered species evaluation. The site walk-through was limited to easily accessible areas outside existing buildings. No audit or evaluation of the on-site buildings was included in the investigation. The PA indicated several environmental issues to be addressed at the site, including: underground storage tanks (USTs), aboveground storage tanks (ASTs), on-site electrical transformers, certain motor pool waste handling and storage activities, several soil gas anomalies, the storm sewer systems, surface runoff, and several other small compliance issues.

The PA did outline a detailed perspective of possible site contaminants derived from the non-intrusive, passive soil gas survey RMC conducted at selected portions of the PSF. The Petrex™ soil gas survey measured the flux of pre-selected volatile organic compounds via mass spectrometry. This method accurately characterizes the types and spatial relationships of contaminants, but provides no information concerning specific concentrations. The survey documented the presence of compounds within central and western portions of the site, including: tetrachloroethylene (PCE), trichloroethylene (TCE), dichloroethylene (DCE), freon, combined aromatics, and naphthalene.

Within the PA, RMC referred to previous geotechnical borings installed at the site from September 1958 to July 1959. No reference is given as to who completed these borings; however, a total of 48 were reportedly installed, recording the lithology and depth to groundwater. The PA included a "piezometric map" contouring depth to groundwater encountered during these borehole installations. This map, although not representing a true water table elevation, indicated a generalized north-northwest groundwater flow direction at PSF. Since no synoptic water level measurements were taken, the piezometric information

gathered revealed only an approximate indication of the true groundwater flow direction at the site.

The PA Report was submitted in 1991 to the New Jersey Department of Environmental Protection and Energy (NJDEPE), which is currently designated as the regulatory lead agency for the PSF site.

## 1.2 Environmental Investigations of Surrounding Sites

The Philadelphia District of the ACOE is responsible for maintaining the navigational channel within the Delaware River. The dredged material resulting from these operations is disposed of in a number of Corps-maintained storage sites adjacent to the Delaware River. Dredged materials stored at the 1200-acre Pedricktown North and South Storage Areas are from the Marcus Hook, Bellevue, and Cherry Island ranges, and from the Marcus Hook Anchorage within the Delaware River. Pedricktown North and South, located adjacent to the PSF site, is reported to have received approximately 2.5 million cubic yards of dredged material annually from the channel, although lately operations have slowed to every other year.

Sixteen groundwater monitoring wells were installed by Betz-Converse-Murdock Inc. (BCM) of Plymouth Meeting, Pennsylvania, at both of the storage areas in May and June 1980. These wells, along with river sediments and the dredged materials, were sampled between July and October 1980. BCM concluded at this time that no significant groundwater contamination was present in the water samples and that the dredged material and river sediments did not represent major sources for potential groundwater pollution. The ACOE initiated an ongoing groundwater monitoring program to detect possible releases associated with the deposition of any contaminated dredged materials. The ACOE continues to monitor these wells on a semi-annual basis. Some boreholes were redrilled, and wells were reinstalled in 1984. Figure 1.2 depicts the properties surrounding PSF.

The 335-acre Penns Grove Project Area, situated immediately west of the PSF site, was originally designated as an additional storage area for the dredged materials from the Delaware River. However, early in its development, substantial amounts of sand and gravel (the Pleistocene Cape May formation) were found to be present near the surface. From 1974 to 1979, the Philadelphia District of the ACOE leased the property to Robert T. Winzinger, Inc., a private contractor who mined the sand and gravel. At the termination of the project, approximately 3,000,000 cubic yards of soil had been excavated from the Penns Grove site and Winzinger had significantly increased the surficial exposure of

the Cape May formation. This exposure of the Cape May formation, an important aquifer in the Penns Grove/Deepwater area, created a lake from the infiltrating groundwater (Appendix A, Photograph 2).

Prior to and during the Penns Grove Project excavation operations, 104 borings were installed at the property. These were drilled by various contractors during several different periods: boreholes DGB40-51 were drilled in 1967, boreholes DGB52-57 were drilled in 1976, boreholes DGW01-05 were drilled in 1978, boreholes DGB58-99 were drilled in 1980, and boreholes DGB100-104 were drilled in 1982. Boreholes DGW01-05 were converted to permanent piezometers for water quality monitoring purposes. Cross-sections of the borehole geologic logs revealed that the surface of the Cretaceous Raritan-Magothy-Potomac formation was eroded prior to Pleistocene deposition. A paleochannel incised into the Cretaceous clays was defined to be filled with Pleistocene sand (the Cape May formation) and trends in a north-south direction across the Penns Grove Project site, with a small branch towards the Delaware River.

In order to use the Penns Grove Project property to store dredged materials, the ACOE decided to install a soil-bentonite slurry wall surrounding the site to insure that future stored dredged material would have no adverse impact on local groundwater resources. The slurry wall was constructed 3 feet wide and deep enough to intercept the 10-foot thick confining clay unit of the Potomac-Raritan-Magothy formation underlying the Cape May. The wall extended in an approximate U-shape around the property, open to the Delaware River. The top of the slurry wall was set 4-5 feet lower than the existing ground surface. The length of the wall totaled approximately 11,000 feet and its depth, dependent on interception of the Cretaceous clays, varied from 20-60 feet bgs. The slurry itself consisted of 70 parts sand, 30 parts silt, and 2% bentonite. Before installation, the ACOE had the slurry mixture sampled for permeability testing, resulting in permeabilities of less than 2.83 X $10E^{-4}$ feet per day (ft/day).

Although the Penns Grove site was originally designated as an additional storage area for Delaware River dredged materials, it has never been used as such to date. However, along with the monitoring wells at the Pedricktown North and South facilities, the ACOE monitors the Penns Grove Project piezometers on a semi-annual basis.

Four sites in the vicinity of the PSF are undergoing various environmental assessments and investigations led by the NJDEPE. These sites, listed below, are located between one and two miles east-northeast of PSF and appear to be located

hydrogeologically cross-gradient from the site. Review of hydrogeologic data from these facilities in NJDEPE files suggests that groundwater impacts associated with past activities at these sites are not expected to migrate towards PSF.

- B.F. Goodrich (NJDEPE Case No. NJ004286); assessment being conducted under the auspices of the NJDEPE Bureau of Aquifer Protection.

- Exxon Chemical (NJDEPE Case No. NJ0077496); presently under the regulatory review of the NJDEPE Bureau of Ground Water Discharge Control.

- N.L. Industries; RI/FS near completion under the direction of the NJDEPE Division of Hazardous Waste Remediation.

- Browning-Ferris (Maintech Inc.); an ECRA/ISRA site under evaluation by the NJDEPE Bureau of Ground Water Enforcement.

### 1.3 Expanded Site Inspection Objectives

Expanded Site Inspection objectives were defined in the EPA Transitional Guidance Document for Fiscal Year (FY) 1988. Although various other site inspection scopes, such as a Listing Site Inspection (LSI) and Screening Site Inspection (SSI), postdate the ESI Guidance Document, the latter was chosen as the best applicable guidance at the PSF in accordance with the scope of work specified in the USAEC delivery order. The ESI work plan structure was weighted in conjunction with the project specific priorities established before project plan implementation at the August 26, 1992, initiation meeting.

According to EPA's Guidance Document, ESI's are intended to:

- Provide additional data in support of revised HRS scoring.
- Provide the first generation of information for sites evaluated using the revised HRS.
- Identify situations requiring removal action.
- Provide more information on site characteristics, contaminant sources (waste type and volume), and migration pathways to the remedial contractor for timely development of the RI work plan.
- Shorten the remedial planning process.
- Encourage better communication and transfer between pre-remedial and remedial contractors.

The primary issues of concern of the PSF ESI included: delineation of on-site contaminant sources and plumes; delineation of potential off-site contaminant migration; determination of the HRS scoring for the site; interpretation of the associated risks to local groundwater resources; and a complete hydrogeological characterization of the PSF site for future assessment phases (should such actions become necessary).

A preliminary risk assessment was also included among the ESI objectives. The risk assessment conducted was semi-quantitative in nature and involved the following approach:

- Evaluation limited to the most contaminated site media.
- Evaluation of the most toxic contaminants in these media, including Class A and B carcinogens and toxic non-carcinogens.
- Establishment of target risk levels based on the most conservative future land use scenarios (i.e., residential area with children).
- Comparison of risk associated with maximum site concentrations versus target risk levels.

## 1.4 Investigation Strategy

Site characterization at the PSF site was structured to evaluate aqueous and soil media. The sampling program was developed to support each ESI objective, with a particular emphasis on providing more information on site characteristics, contaminant sources (waste type and volume), and migration pathways. These data were acquired through the strategic placement of soil borings, groundwater monitoring wells, and surface water/sediment (storm drain and/or drainage swale) sampling stations.

A number of solid waste management units (SWMUs) and areas of concern (AOCs) were identified in the PSF PA Report and ESI Project Plan (Figure 1.3). Numerous potential contaminant sources exist at the site, but in view of the objectives of the ESI, an attempt was made within the Project Plan to develop a sampling strategy which streamlined total site sampling requirements. For this reason, each individual SWMU and AOC was not assessed independently. Instead, SWMUs and AOCs were grouped into separate study areas and assigned a total number of sampling stations based on a prioritization scheme. Factors used to judge the relative importance of individual study areas and the degree of sampling effort they received included: geographic location (e.g., proximity to site boundaries); size; types of SWMUs and AOCs; anticipated contaminants and concentrations; and previous soil gas anomaly data.

The PA Report provided much of the basis for establishing the AOCs on-site. Along with the PA Report, information acquired from an aerial photo review and from various site plans indicating all underground and aboveground tank locations, all buildings and reference points, as well as the sewer, water, and utility line distribution network, was utilized in designing and implementing the investigation at PSF.

The identification of AOCs was based on consolidated information that included:

- Areas of stained soil or possible undifferentiated waste piles as indicated in historic site aerial photos;
- The locations of active systems of general environmental concern (e.g., underground storage tanks, the sewage treatment plant, and current chemical storage areas);
- The locations of inactive or former SWMUs (e.g., the former scrap metal storage area) from site aerial photos; and
- Soil gas flux data acquired from selected soil gas studies conducted at the site and documented in the PA Report.

A complete list of AOCs, including a brief description, location, and a means of identification, is provided in the ESI Project Plan.

Initially, the suspected contaminants of concern at the PSF site were the following: petroleum hydrocarbons, volatile organic compounds (including benzene, toluene, ethylbenzene, and xylene (BTEX) and chlorinated solvents), semi-volatile compounds (including polycyclic aromatic hydrocarbons [PAHs]), explosive parameters (including picric acid, nitrocellulose/nitroglycerin, 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, tetryl, HMX, and RDX), and heavy metals (including lead, cadmium, and chromium). In order to confirm the existence of these suspected contaminants on-site, as well as assess soil and water quality conditions on a site-wide basis, it was necessary to establish priorities for which AOCs and SWMUs were monitored. Sampling locations selected in the ESI Project Plan were based on one or more of the following criteria:

- Proximity to known or suspected waste disposal or storage areas;
- Location within an area of apparent stained or disturbed soils;
- Proximity to USTS;
- Distance from down-gradient facility boundaries; and
- Location within areas of soil gas flux maxima as determined from the PA Report.

In order to accurately assess the geologic and hydrogeologic framework at the PSF, the ESI Project Plan set up a total of 34 separate sampling stations, including:

- Nineteen groundwater monitoring wells, each of which provided one water sample and one subsurface soil sample. Surface soil samples were collected at 16 of the 19 monitoring well locations;

- Five soil borings, continuously sampled from grade to the soil/water interface to characterize possible areas of soil contamination;
- Seven surface water and 5 sediment samples acquired from storm water catch basins and drainage swales contiguous to equipment wash down areas or waste/chemical storage areas, as well as the northern down-gradient site boundary; and
- Three previously existing off-site groundwater monitoring wells provided water samples to support evaluations of potential off-site contaminant transport.

Versar also installed the following, although they were not sampled for chemical analysis:

- Three piezometers, drilled and logged to the complete depth of the aquifer, were utilized for further aquifer testing, lithologic description, and determination of groundwater flow direction.

In general, each sampling location was analyzed for TCL and TAL Parameters and Total Petroleum Hydrocarbons. Sampling locations in the north-central portion of PSF, as well as those used for background purposes, were also analyzed for explosive compounds. Specific analyses for the various site media are discussed in the Surface Water, Soil Materials, and Groundwater sections of this report (Sections 3.0, 4.0, and 5.0). A detailed list of requisite analyses, analytes, and associated methods for each sample matrix is presented in Sections 3.3 and 3.7 of the Quality Assurance Project Plan included in the ESI Project Plan.

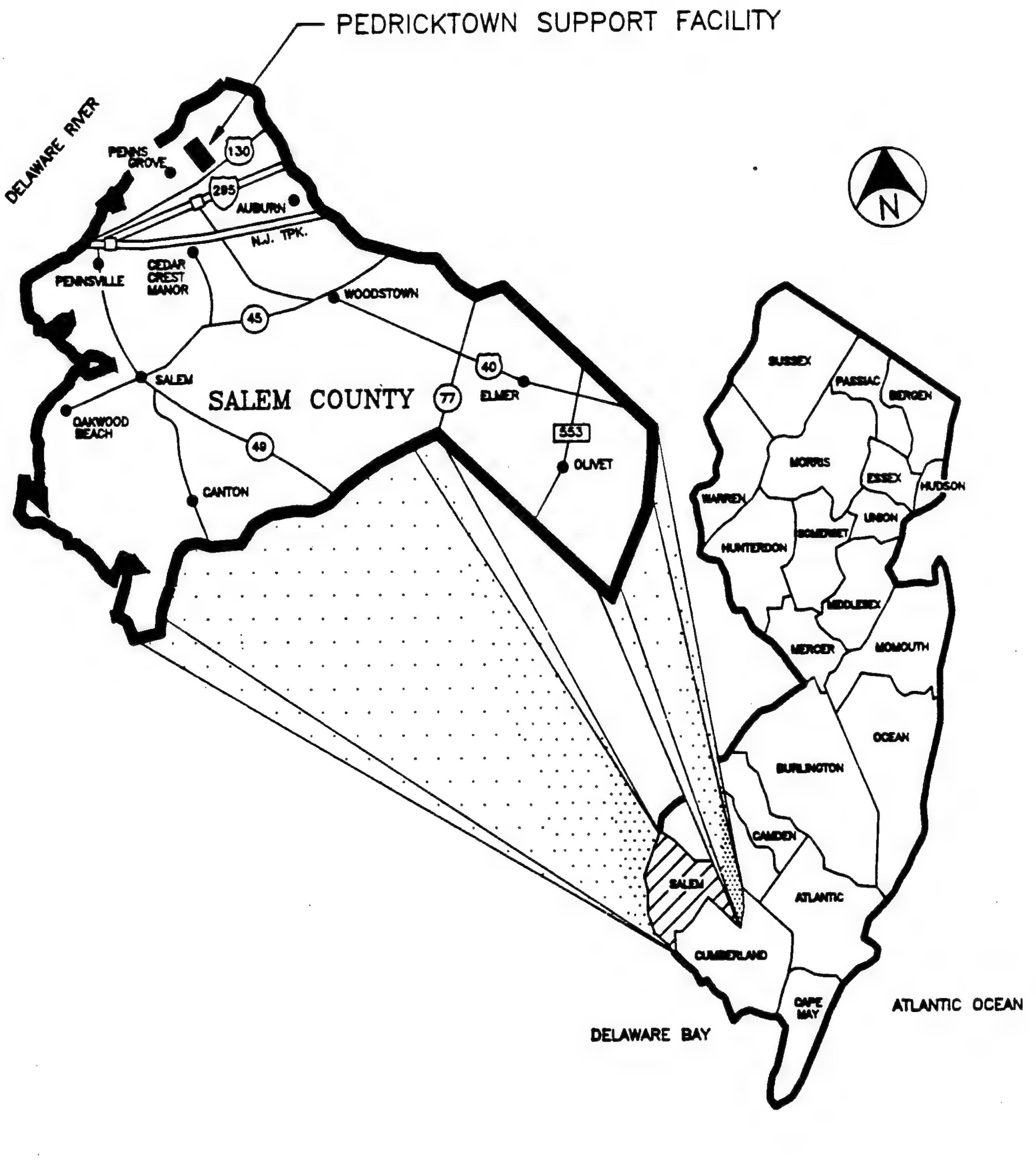
The four study areas originally outlined in the ESI Project Plan were combined for data comparison purposes in this report. The decision to review analytical data on a site-wide basis was made following a preliminary review. The occurrence of sporadic water and soil contaminants at PSF was not observed to correlate with previously defined study areas or even individual SWMUs. Therefore, all impacted media found at PSF during the ESI are evaluated on a case-by-case basis. Site interrelationships are then discussed where and when apparent.

### 1.5 Report Overview

This report consists of 12 sections describing the PSF site and the investigation process and findings. Section 1.0, Introduction, describes the site background, previous investigations, and objectives of the ESI. Section 2.0 describes the entire site setting, including regional, local, and site specific natural/physical environments. Section 3.0 defines the surface water bodies,

drainages, and sediments associated with the PSF site, and also provides an evaluation of the chemical analysis of the samples collected. Section 4.0 defines the subsurface and surficial soils applicable to the site and discusses the analytical results from those samples collected. Section 5.0 defines the hydrogeologic environment at the site and discusses aquifer properties, groundwater quality, modeling, groundwater flow, and transport pathways. Section 6.0 discusses the hazardous substances generated on-site. Section 7.0 describes the possible contamination sources on-site, including specific areas of concern, confirmation of tank locations, an inventory of electrical transformers, and the unexploded ordnance survey. Section 8.0 discusses human health and environmental concerns, including the preliminary risk assessment and the site HRS scoring. Section 9.0 discusses the quality assurance and quality control procedures followed during the ESI investigation. Section 10.0 presents the ESI summary and conclusions, and Section 11.0 contains future recommendations for the site. Section 12.0 contains the references consulted in preparation of this report.

Twenty-one figures are included in this ESI report. The 18 larger figures are bound in plastic sheet covers for protection and presentation. Thirty-one tables are included to summarize the ESI findings and results, and eleven appendices are labeled alphabetically.

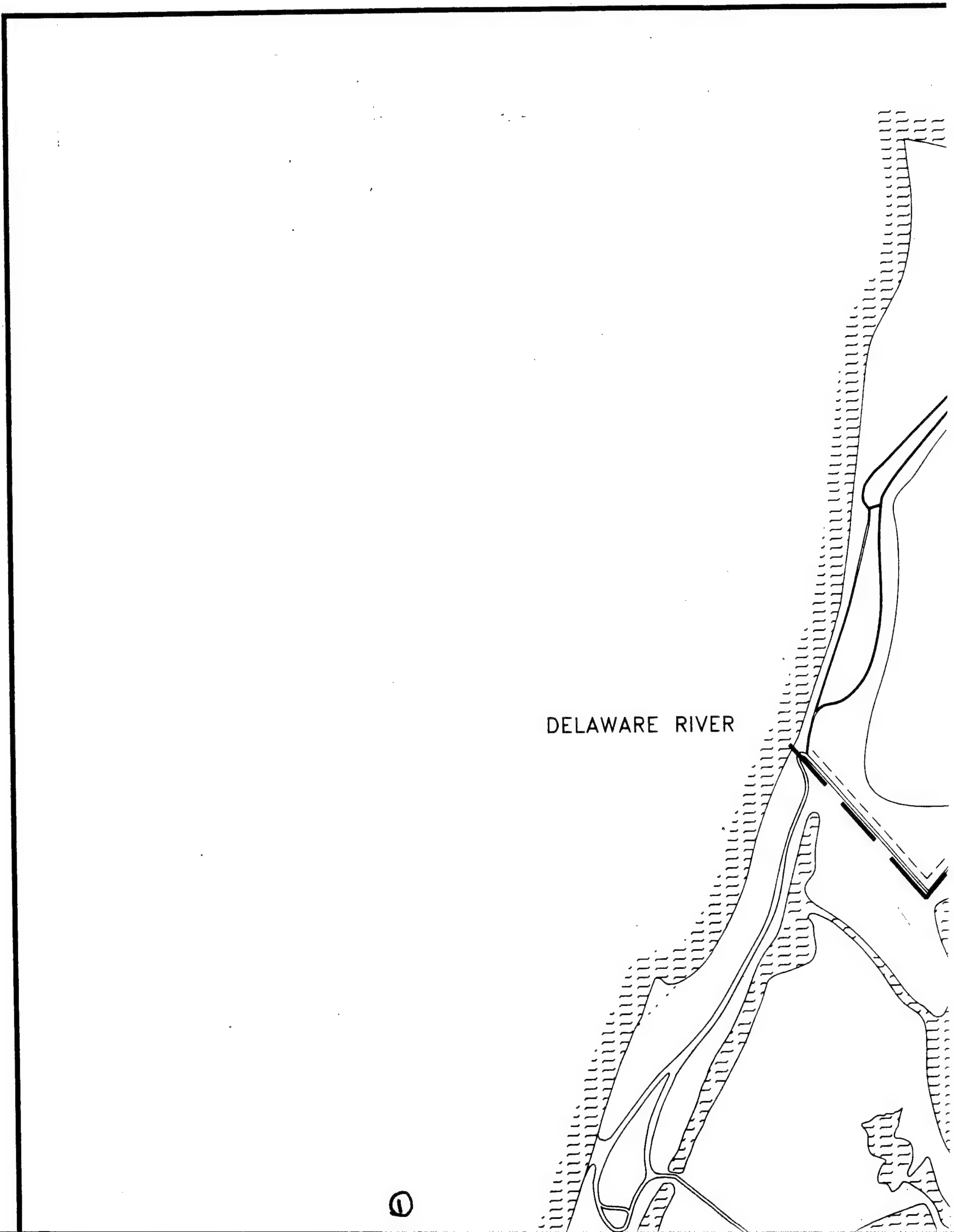



**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

# FIGURE 1.1

GENERAL SITE LOCATION MAP

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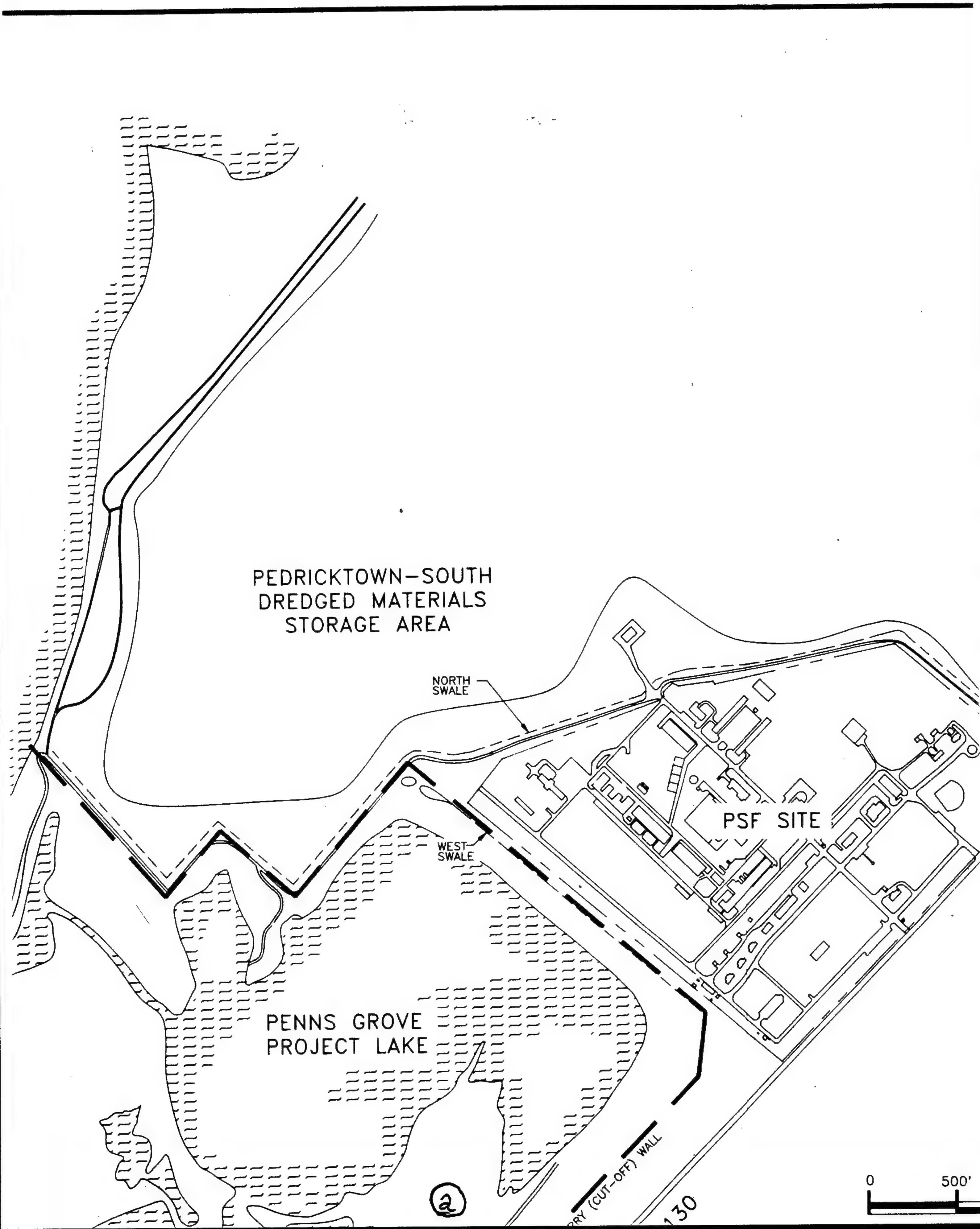
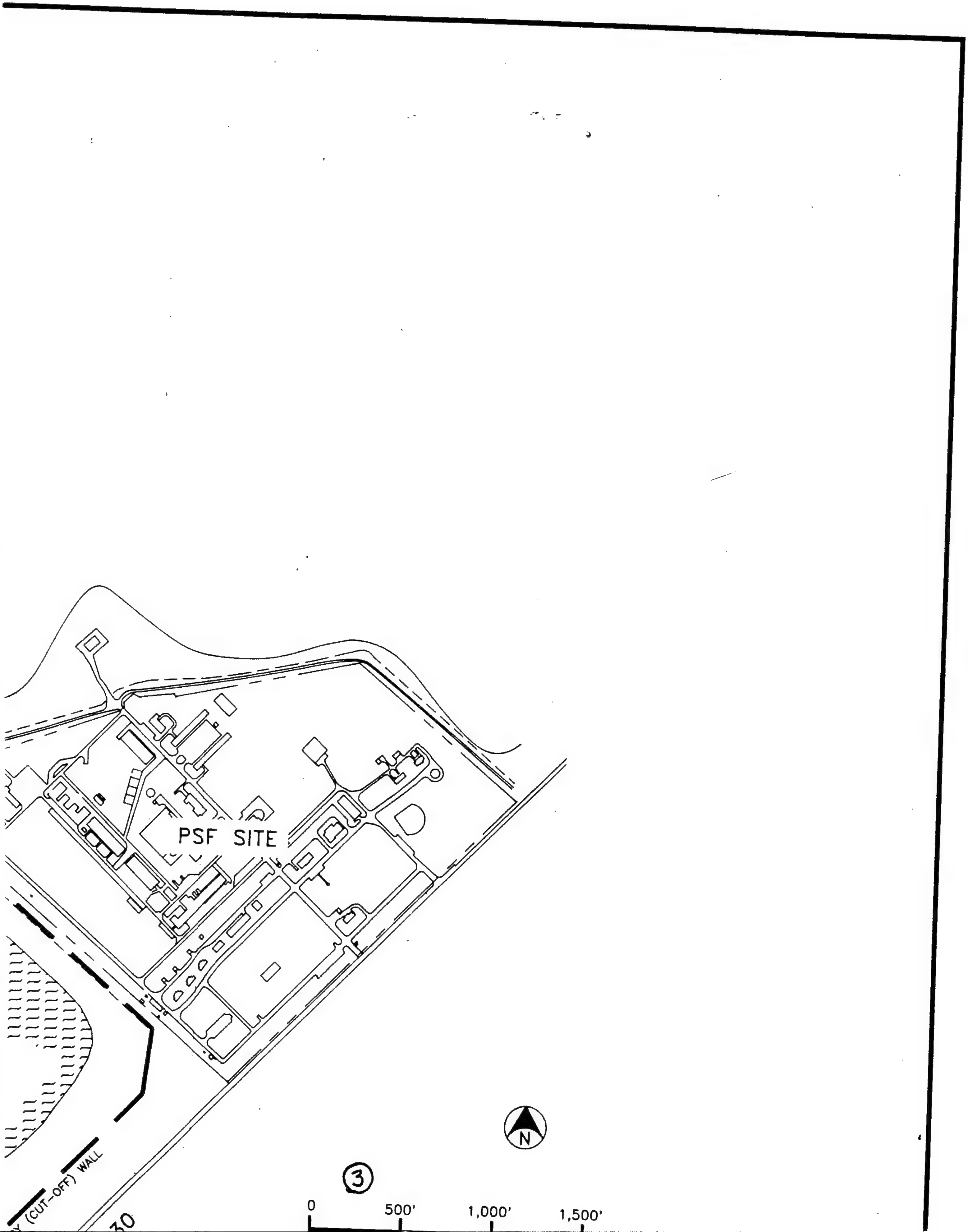
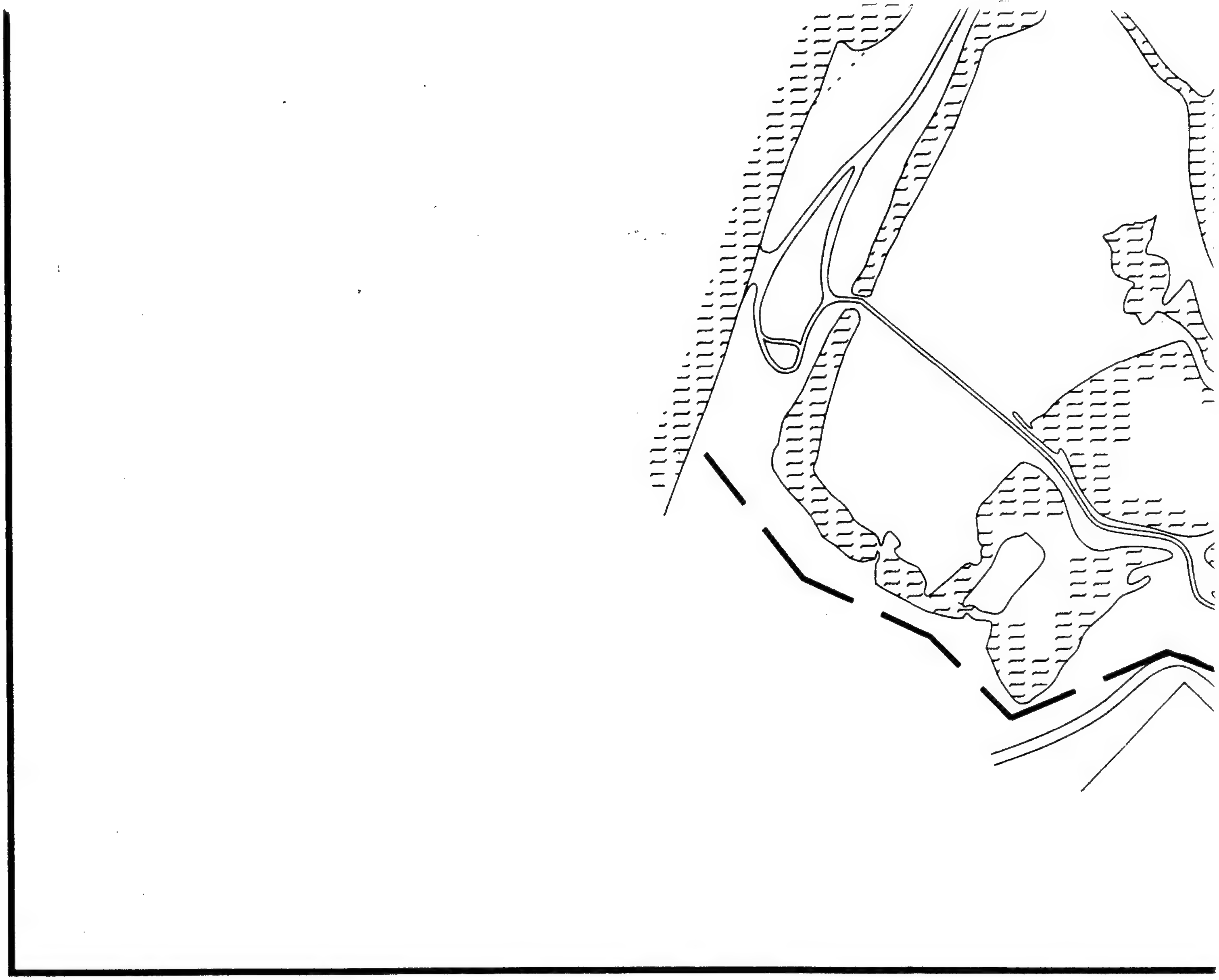
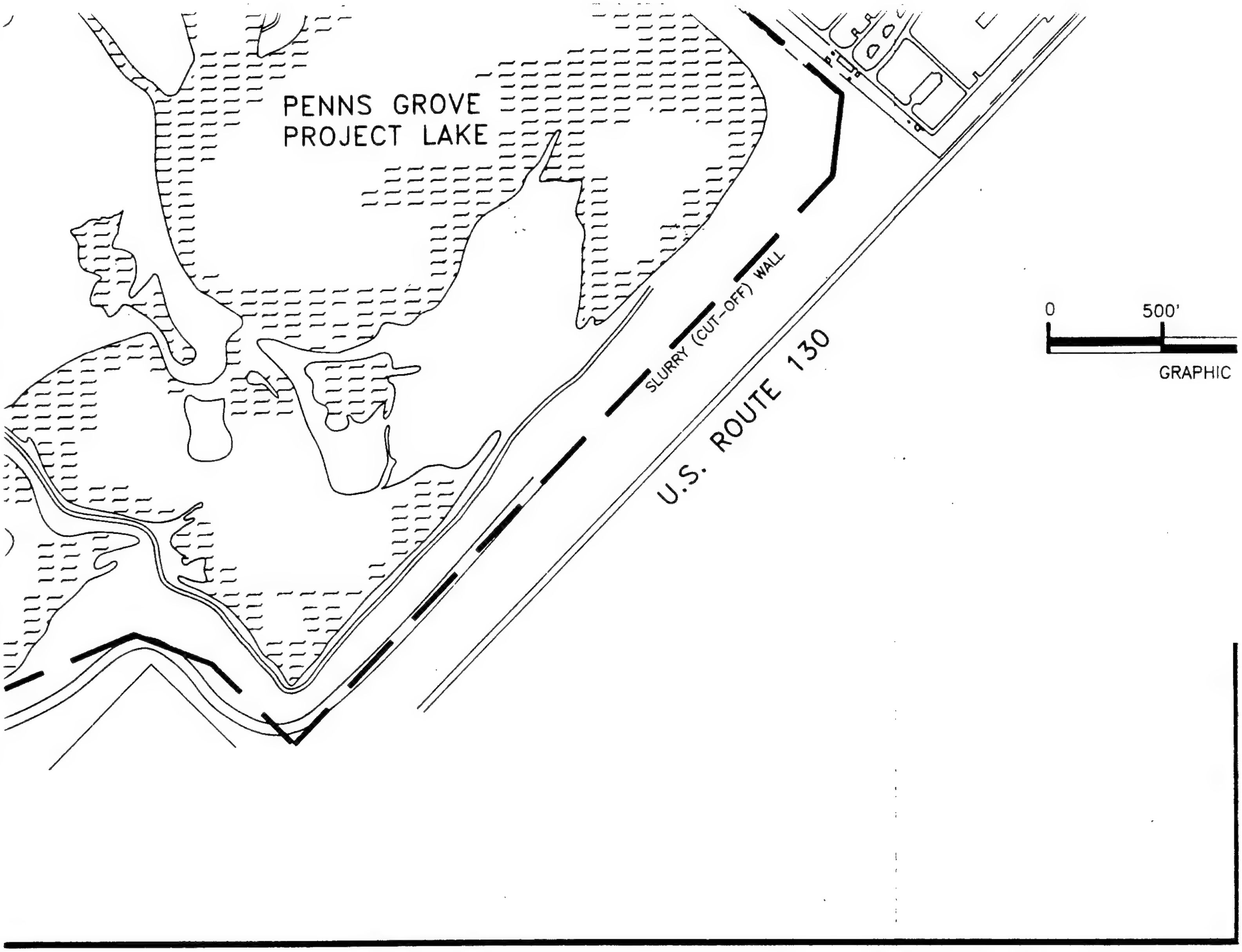
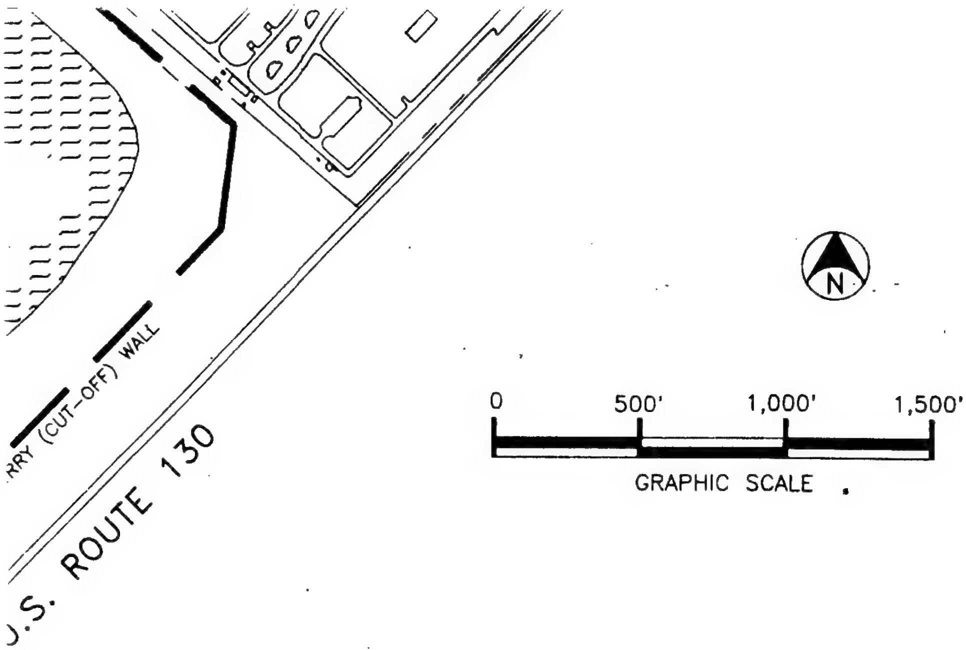

PEDRICKTOWN–SOUTH
DREDGED MATERIALS
STORAGE AREA
NORTH
SWALE
PSF SITE
WEST
SWALE
PENNS GROVE
PROJECT LAKE
(CUT-OFF) WALL
130
0
500'


PSF SITE
(CUT-OFF) WALL
30
N
3
0
500'
1,000'
1,500'




PENNS GROVE
PROJECT LAKE
SLURRY (CUT-OFF) WALL
U.S. ROUTE 130
0
500'
GRAPHIC

5




| NO. | REVISIONS | BY | CHK | APP | DATE |
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**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | | DATE 10/06/93 |
| DRAWN | KEMLER | 10/06/93 |
| CHECKED | TRANTOW | 10/06/93 |

# FIGURE 1.2
SURROUNDING PROPERTIES MAP

Versar INC.
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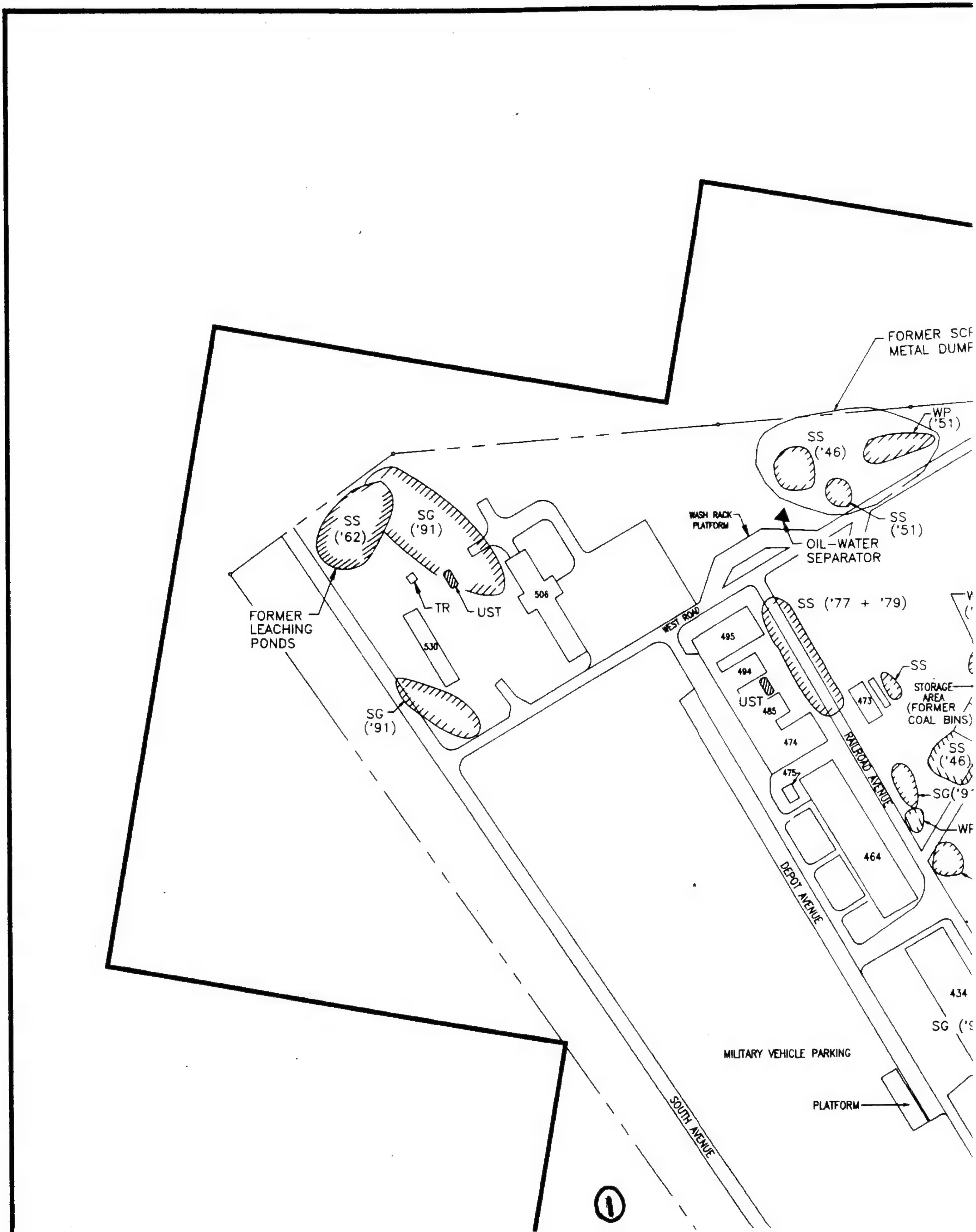
(215) 741-4211

PROJECT NO. 2060.000 | SCALE NOTED

6


FORMER SCR
METAL DUMP
WP
('51)
SS
('46)
SS
('51)
WASH RACK PLATFORM
OIL-WATER
SEPARATOR
SS
('62)
SG
('91)
TR
UST
506
FORMER
LEACHING
PONDS
530
WEST ROAD
495
494
UST
485
474
473
SS ('77 + '79)
SS
STORAGE AREA
(FORMER
COAL BINS)
SS
('46)
SG('9
WP
SG
('91)
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PLATFORM
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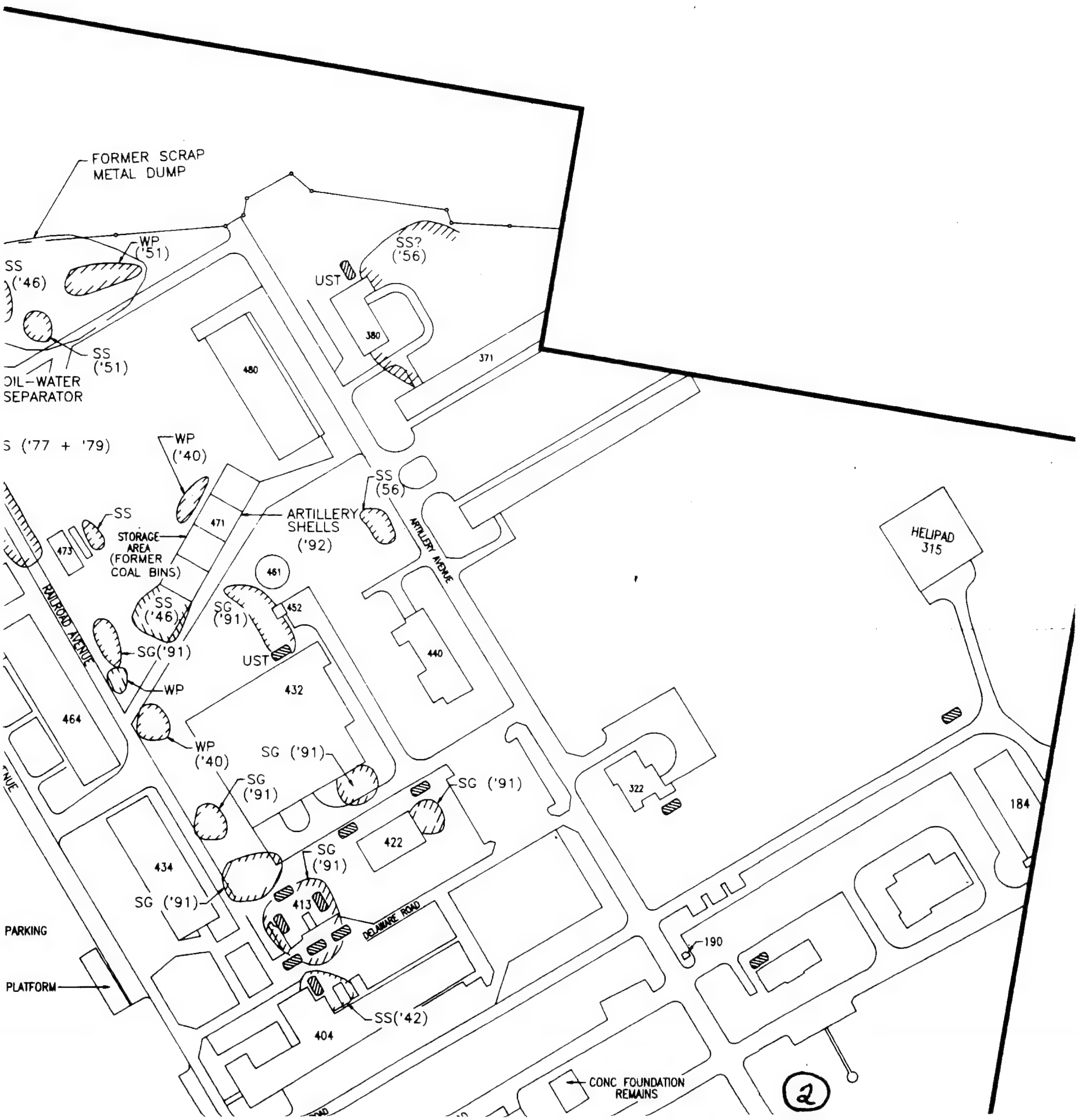


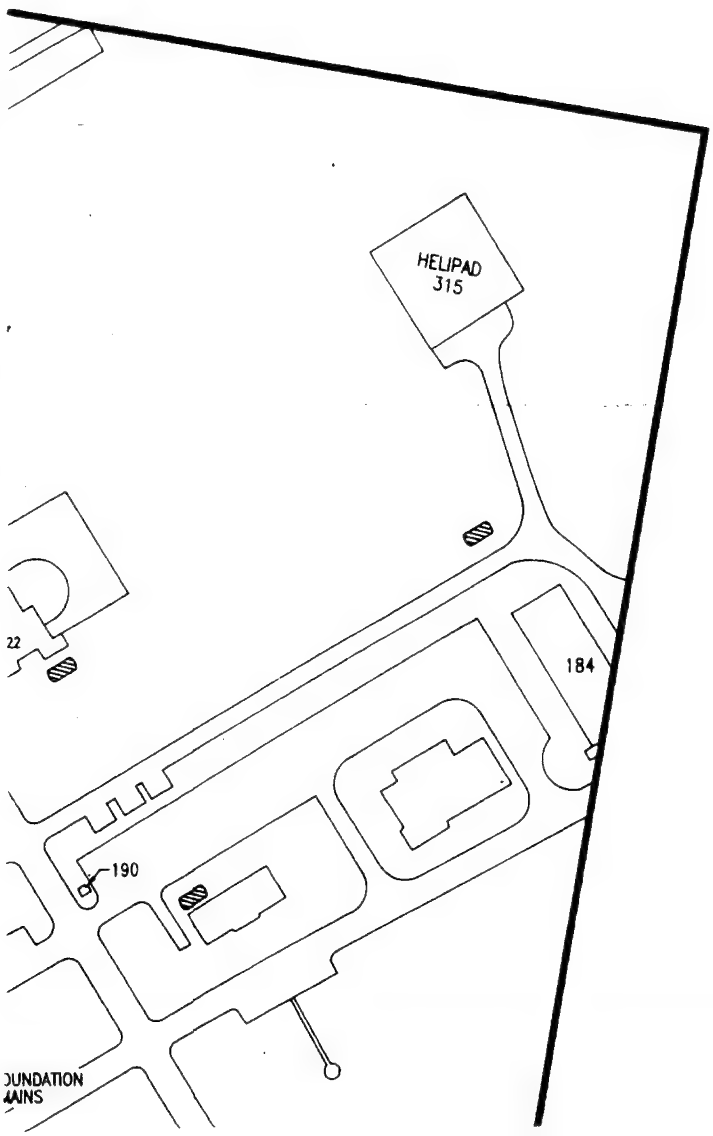
FORMER SCRAP METAL DUMP
WP ('51)
SS ('46)
SS ('51)
OIL-WATER SEPARATOR
S ('77 + '79)
UST
SS? ('56)
380
371
480
WP ('40)
471
ARTILLERY SHELLS ('92)
SS (56)
ARTILLERY AVENUE
SS
STORAGE AREA (FORMER COAL BINS)
473
RAILROAD AVENUE
SS ('46)
461
SG ('91)
452
UST
SG('91)
WP
440
HELIPAD 315
464
432
WP ('40)
SG ('91)
SG ('91)
SG ('91)
322
184
434
422
SG ('91)
SG ('91)
413
DELAWARE ROAD
PARKING
190
PLATFORM
SS('42)
404
CONC FOUNDATION REMAINS
2

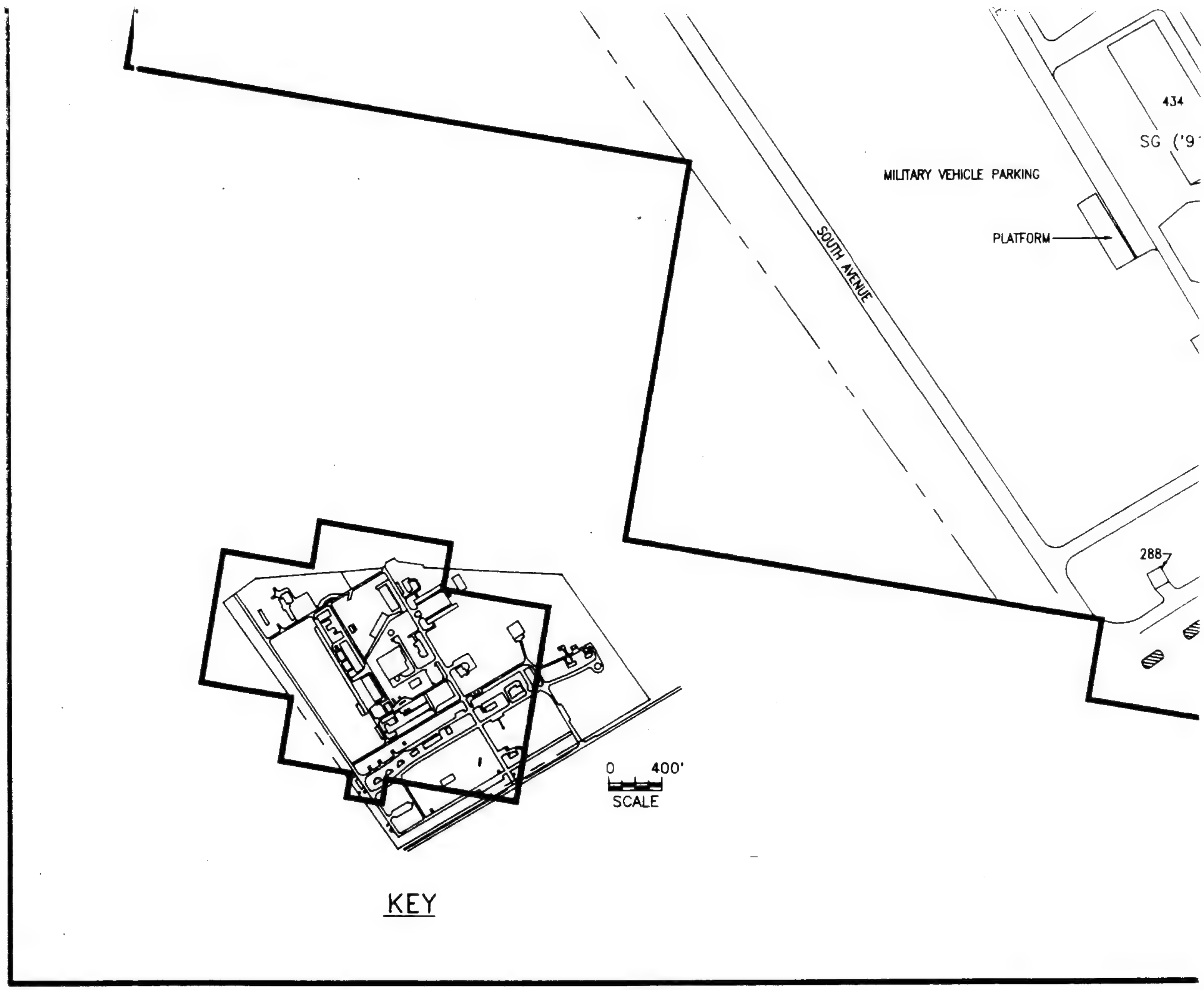
## LEGEND

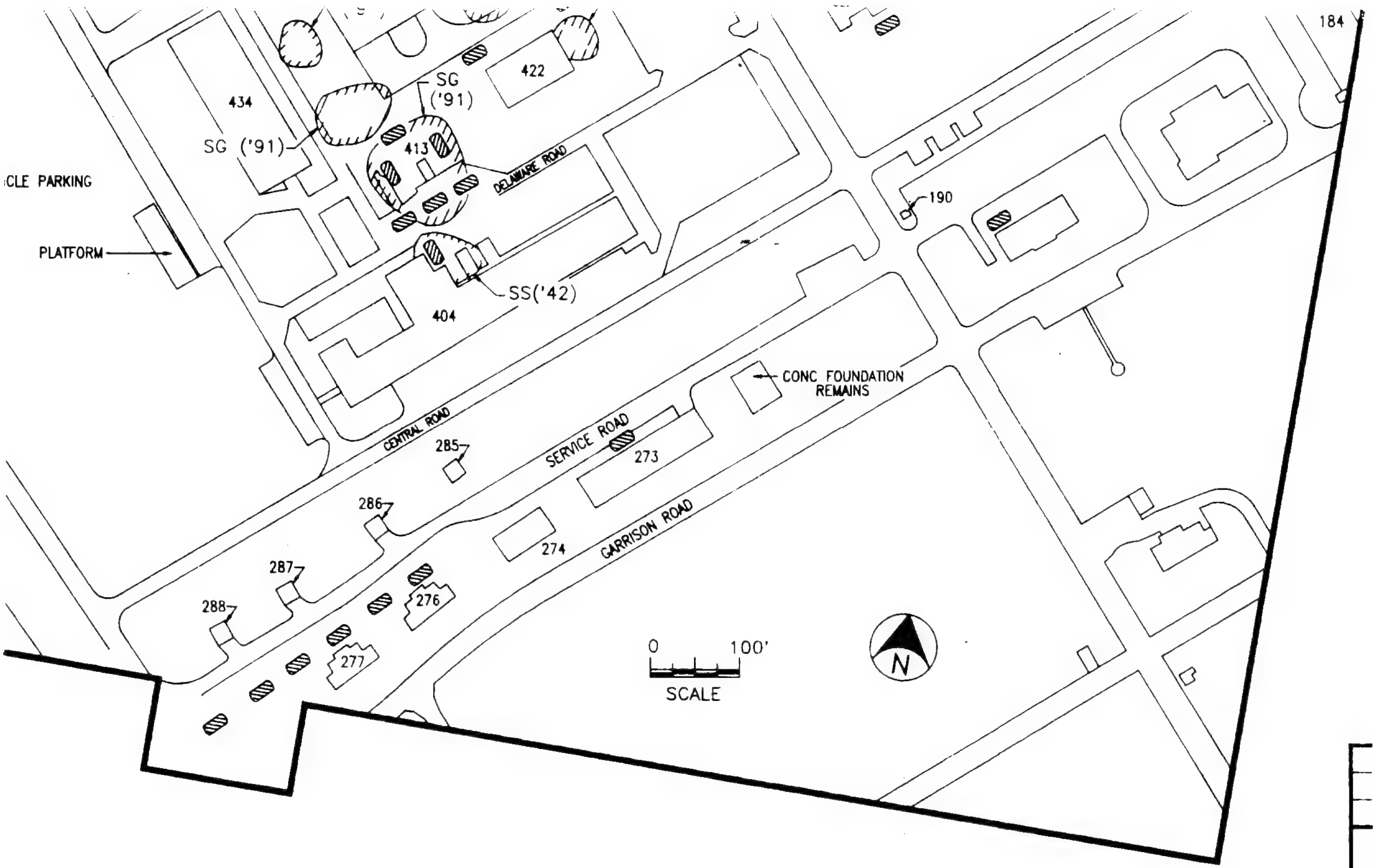
| | | |
|---|---|---|
| UST | — | UNDERGROUND STORAGE TANK |
| SG | — | SOIL GAS FLUX MAXIMA |
| * SS | — | STAINED SOIL (AIR PHOTO DATE) |
| * WP | — | WASTE PILE (AIR PHOTO DATE) |
| TR | — | TRANSFORMER |
| | — | SWMU or AOC |
| | | SITE BOUNDARY |

## NOTE

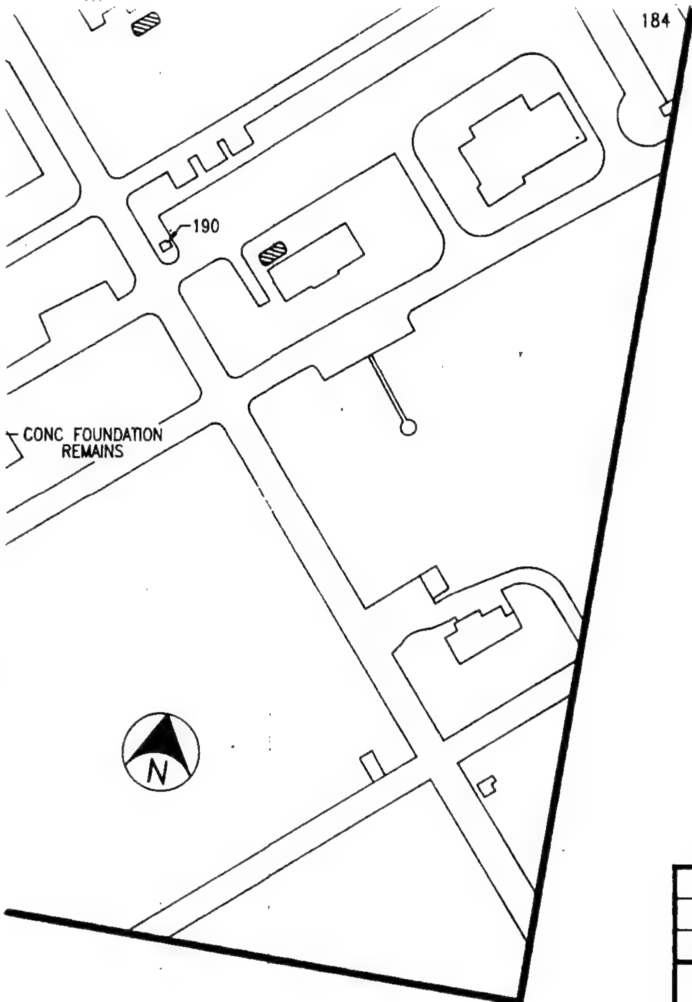
* — BY AERIAL PHOTO INTERPRETATION




434
SG ('9
MILITARY VEHICLE PARKING
SOUTH AVENUE
PLATFORM
288
0 400'
SCALE
KEY


184
422
434
SG ('91)
SG ('91)
413
DELAWARE ROAD
CLE PARKING
PLATFORM
190
SS('42)
404
CONC FOUNDATION REMAINS
CENTRAL ROAD
285
SERVICE ROAD
273
286
274
GARRISON ROAD
287
276
288
277
0 100'
SCALE
N

FOCUS AREA

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**PEDRICKTOWN SUPPORT FACILITY**
SALEM COUNTY, NEW JERSEY

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| DESIGNED ASHTON | DATE 11/2/93 | |
| DRAWN KEMLER | 12/7/93 | |
| APPRVD. TRANTOW | 12/10/93 | |

**FIGURE 1.3**

MAP OF SWMU's AND AOC's

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

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| PROJECT NO. 2060.000 | SCALE: 1" = 100'-0" |
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## 2.0 SITE SETTING

### 2.1 Demography

The PSF site located in Oldmans Township, Salem County, New Jersey, is in an area bordered by the Delaware River and dredged river materials to the west, wetlands and rural farmlands to the east, dredged river materials to the north, and a man-made lake and residential area to the south. Route 130 runs along the eastern property boundary of the facility. The nearest heavily populated area is located approximately 0.5-1 mile south of the site.

A review of 1990 census information available for a 3-mile radius surrounding the facility revealed that Salem County has a population of 65,294. The census information included a breakdown of population according to age, persons per household, total number of households, etc. According to the census, 83.3% of the residents within the study area are Caucasian, 14.7% are African-American, and 2.0% are "other." Approximately 18,566 people are under age twenty, 23,896 are age 20-40, 13,274 are age 44-65, and 9,558 people are over 65. The median value of an owner-occupied household is $33,155, while the monthly medium rent is $452. Approximately 20 people live in residential complexes within 0.25 mile of the site, 70 people within 0.5 mile, 434 people within 1 mile, 4,508 people within 2 miles, 14,735 people within 3 miles, and 28,374 people within 4 miles of the site.

Salem County consists of 15 civil divisions, including one city, eleven townships, and three boroughs. Salem County's population has increased 11.5% from 58,711 in 1960 to 65,294 in 1991. According to the 1991 Census of Salem County, 55.98% of the population live in urban areas of the county and 44.02% live in rural areas.

### 2.2 Land Use

According to the Salem County Zoning Board, the site is classified as public (Zoning P) and is sparsely populated most of the time, except for two weeks out of the year and two days each month. At these times, the facility is heavily populated by military personnel who conduct military exercises in the immediate vicinity. Approximately 29 people currently live at PSF. This small population consists only of military personnel and their families. Fourteen of the reported 29 people are children. The duration of a military post at PSF is approximately 3-5 years.

## 2.3 Natural Resources

Underlying the PSF site, the Cape May formation of Pleistocene age contains sand and gravel that locally have been utilized as fill material. In the early 1980s, a significant portion of the Cape May formation was excavated southwest of the PSF site by a local contractor, resulting in the Penns Grove Project lake. The sand and gravel mined as a natural resource for the area was sold as fill material.

Although not necessarily considered a natural resource, natural preservation wetlands areas exist in the vicinity of PSF. No freshwater or coastal wetlands exist within site boundaries. However, approximately half of the area within a 1-mile radius of the PSF site is freshwater wetlands. Few coastal wetlands exist within a 2-mile radius. According to the PA Report, no endangered species inhabit PSF or its vicinity.

## 2.4 Geology and Hydrogeology

### 2.4.1 Regional Geologic Setting

Oldmans Township of Salem County, New Jersey, is located in the Coastal Plain Province. This province lies southeast of the Fall Line, a demarcation of the transition from the Atlantic Coastal Plain to the Piedmont Province. At this location, the Coastal Plain sediments taper to a thickness of several hundred feet. Surficial geology within Oldmans Township consists of three discrete stratigraphic formations. Underlying them is the Wissahickon formation of late Precambrian age, a bedrock confining layer (Figure 2.1).

Above the Wissahickon lies the Potomac Group-Raritan-Magothy formation of lower to upper Cretaceous age. These three formations are combined in one mappable unit because lateral changes in the character of individual beds, the similarities of lithologies, and lack of data make it difficult to distinguish each individual formation. This group of formations unconformably overlies the Wissahickon formation. Both the Potomac Group and Raritan formations are continental in origin, while the Magothy is continental and marine in character. The Magothy formation is also characterized as possessing isolated locations within the formation where local confining clays are absent. These areas are composed primarily of sand and gravel, forming thinly-banded lenticular sand lenses.

Unconformably overlying the Potomac Group-Raritan-Magothy is the Cape May formation of Pleistocene age. The Cape May formation deposits are alluvial in

origin, as compared to glacial deposits found in the northern part of the state. Non-glacial, alluvial deposits are primarily found in the Coastal Plain Province. The geometry of the Cape May is characterized as tabular-planar.

The youngest formation recognized in Oldmans Township are the alluvial deposits of Holocene age. These deposits are eolian in nature and are found mainly in tidal flats and stream channels.

2.4.2 Formation Description

The Wissahickon formation is composed of metamorphic rocks, such as schist and gneiss. These rocks are characterized by mica, along with quartz, feldspar, garnet, and chlorite. The Wissahickon is typically medium to coarsely crystalline, with a banded texture, and green to gray in color. The overall thickness of the formation is not known.

The Potomac Group, oldest of the three Cretaceous formations, is composed of interbedded sand, gravelly sands, clay, and coarse lignitic material. The sand in the Potomac Group is mainly composed of quartz, while the gravel is composed of quartz and quartzite. The Raritan formation is light-colored quartz sand, gravel, and variegated clay in varying shades of white, gray, yellow, brown, and red. Small amounts of the minerals lignite and pyrite are also present. The Magothy formation, youngest of the Cretaceous stratigraphic sections, consists of alternating beds of lignitic, pyritic, dark-gray to black clay. White, micaceous, fine- to occasional coarse-grained quartz sand and fine gravel are also found within the formation. The Potomac-Raritan-Magothy formation reaches a maximum thickness of 1,000+ feet at the coast.

The Pleistocene Cape May formation is comprised of medium- to coarse-grained quartz sand with abundant gravel and small amounts of clay in varying colors of yellow, brown, gray, and black. The quartz sand ranges from yellow and brown to gray. The sand grains tend to be subangular in shape and poorly sorted. Small amounts of glauconite and possibly limonitic material are found within the Cape May. The thickness of the formation ranges between 150 feet in the southwest corner of the county to approximately 30 feet along streams in the county's interior.

Along the tidal flats and stream channels of Oldmans Township, a mixture of silt, clay, organic material, sand, and gravel are deposited, making up the composition of the Holocene alluvium. Most of this material is composed of fine silt and clay and ranges from 10 to 40 feet in thickness along the Delaware

River. This location of the alluvium allows it to slow the movement of brackish water from the river into the freshwater-bearing material of the underlying formations.

### 2.4.3 Geologic Structure

The top of the Wissahickon formation has an irregular shape and slopes 40 to 140 feet per mile to the southeast (Figure 2.1). The formation is characterized by joints and fractures within the stratigraphic section and crops out in the vicinity of Wilmington, Delaware.

Structurally the Potomac-Raritan-Magothy dips to the southeast, with the top of the Magothy dipping between 36 to 53 feet per mile and the base of the Potomac Group dipping approximately 100 feet per mile. The formation underlies approximately 24 square miles of the Delaware River and extends southwest into the State of Delaware. The formation also outcrops in Salem County, adjacent to the Delaware River.

The Cape May formation underlies approximately 85 square miles of Salem County and crops out adjacent to the Delaware River and its tributaries. The formation is found at maximum altitudes of 90 feet but is usually no higher than 70 feet above sea level. There are no major structural features present in this formation due to its tabular, planar geometry.

The structural configuration of the Holocene alluvium is similar to that of the Cape May formation. No significant geologic features are present.

### 2.4.4 Regional Aquifer Systems

The Wissahickon formation is a bedrock confining unit and not considered a significant aquifer in Salem County. Due to its consolidated nature, movement of water can occur only through joints and fractures within the bedrock. No known wells are installed in this formation in Salem County.

The Potomac-Raritan-Magothy formation contains one of the most productive aquifer systems in New Jersey. As a whole, it has a general hydraulic conductivity of 100.9 ft/day, a specific capacity of 15 gallons per minute per foot (gal/min/ft), and a transmissivity of 6,183 square feet per second ($ft^2$/sec). Reportedly, at a few points throughout the Potomac-Raritan-Magothy aquifer system in New Jersey, thin bands of lenticular sand lenses exist at the uppermost portion of the formation where local confining clays are absent. These areas reportedly have a direct hydraulic connection with the overlying

Pleistocene deposits of the Cape May formation, and have higher yields than areas where confining clays are present.

Four individual aquifers are recognized within this Potomac-Raritan-Magothy formation. The first aquifer is located between 50 and 120 feet below ground surface (bgs) and ranges in thickness from 6-43 feet. The second aquifer is located 150-250 feet bgs and ranges from 10-52 feet thick, with a general yield between 356 and 687 gallons per minute (gpm). This is the most utilized aquifer in the Penns Grove vicinity. Confining clays that exist between this aquifer and overlying aquifer do not have a large areal extent, allowing the aquifers to be hydraulically connected, regionally. The third aquifer within the Potomac-Raritan-Magothy formation is between 300 and 390 feet bgs and 20 to 40 feet in thickness. This aquifer yields an average of 250 to 600 gpm. The fourth aquifer recognized in this stratigraphic unit is from 400-500 feet bgs, approximately 80 feet thick, with a yield of 600 gpm.

The Cape May formation is a very important aquifer system in the Penns Grove vicinity, yielding up to 1,500 gpm. Precipitation recharging the Cape May reportedly infiltrates to older, underlying formations only where local confining clays are absent. However, no evidence of the recharge to older, underlying formations via the Cape May was observed at the PSF site. Salt water intrusion may occur along the Delaware River and along the tidal reaches of its tributary streams, only if the freshwater head is lowered sufficiently (i.e., through water well pumping) near areas where the Delaware River and Cape May formation are hydraulically connected.

The Holocene alluvium deposits along the Delaware River are considered to be semi-confining and of little hydrologic importance.

## 2.5 Site Specific Conditions

### 2.5.1 Site Geology

Site specific geology at the PSF site was interpreted by data acquired from regional cross-sections of Salem County, New Jersey, and local cross-sections created by Versar. The local cross-sections were developed from a review of lithologic logs and cross-sections completed during investigations at Penns Grove Project lake, the Pedricktown North and South dredged material storage areas acquired from the ACOE, and 27 boring logs developed by Versar during the ESI investigation. The Cross-Section Location Map and the three cross-sections A-A',

B-B′ and C-C′ are included as Figures 2.2, 2.3, 2.4, and 2.5. Site boring logs are attached as Appendix B.

The PSF site is underlain by three distinct formations ranging from Precambrian to Pleistocene in age. The Precambrian Wissahickon bedrock unit was not encountered during the on-site drilling of shallow groundwater monitoring wells. However, review of geologic cross-sections of Salem County indicates that this bedrock formation would be encountered approximately 310 feet bgs underneath the site.

Unconformably overlying the Wissahickon formation is the Potomac-Raritan-Magothy formation of early to upper Cretaceous age. Figure 2.6 depicts the surficial exposure of the Cretaceous formations. The top of the formation was encountered during the drilling of piezometers P4-001, P9-001, and P15-001 at an approximate depth of 27-30 feet bgs or 20-30 feet below mean sea level (msl). The formation dips to the southeast and is estimated at greater than 100 feet thick at the site. According to the various geotechnical logs collected by Versar and the ACOE, the upper portion of this Cretaceous formation is composed primarily of clays designated as CL-CH under the Unified Soil Classification System (USCS). The clays are inorganic with low to high plasticity in nature and range in color from white, gray, yellow, brown, black, to red. Isolated soil lenses designated by the USCS as SM, ML, OH, GP, SP, and SC exist within the formation near the north swale, starting approximately 35-40 feet bgs or 45-50 feet below msl (Figure 2.5). Descriptions of the USCS designations are given on each cross-section.

Overlying the Potomac-Raritan-Magothy formation is the Cape May formation of Pleistocene age. Approximately 27-30 feet thick, the unit lies unconformably over the Cretaceous formation, has an estimated porosity of 30%, and is relatively planar in geometry. Generally, the Cape May soil is classified by the USCS as SP-SM, according to sieve analysis from soil samples taken at different depths in 27 on-site soil borings. The soil is described as poorly graded sands or gravelly sands with little or no fines to sand-silt mixtures. The formation also contains small lenses of poorly graded gravel or gravel-sand mixtures with little or no fines, to clayey gravel or gravel-sand-clay mixtures. These soils appear throughout the PSF site.

Holocene alluvial deposits were not encountered during drilling activities at the PSF site since these deposits are developed only locally in streams, creeks, and immediately adjacent to the Delaware River (Figures 2.5 and 2.7).

### 2.5.2 Site Hydrogeology

Geologic and hydrogeologic data acquired during the drilling, installation, and sampling of 19 groundwater monitoring wells and 3 piezometers at the PSF site provide the basis for determining aquifer characteristics, geometry, hydraulic gradient, and hydraulic conductivities. Raw data used to define these parameters were generated from the site boring logs, synoptic water level measurements, and slug testing activities. Data reduction involved the preparation of cross-sections, two water table flow maps, a hydraulic conductivity trend map, and predicted transport pathways. Final interpretations were evaluated for consistency with published regional geologic and hydrogeologic data for southern New Jersey and Salem County.

#### 2.5.2.1 Aquifer Characteristics

The aquifer systems underlying the PSF site are composed primarily of sands, gravels, and clays that overlie Precambrian bedrock. The aquifers are comprised of the sediments of the Potomac-Raritan-Magothy and Cape May formations. Aquifer soil classifications are depicted in cross-sections presented in Figures 2.3, 2.4, and 2.5. Aquifer and confining unit soil types, as described by the USCS, range from inorganic clays (CL-CH) in the Potomac-Raritan-Magothy aquifer system to poorly graded sands, gravelly sands, and silty sands (SP-SM) in the Cape May aquifer. The Cape May formation represents the uppermost aquifer at PSF. The aquifer is unconfined, and groundwater flows through it in a west-northwest direction toward the Delaware River.

#### 2.5.2.2 Aquifer Geometry

The classification of soils penetrated during drilling activities, together with observations relative to the degree of saturation in these soils, was used to characterize the thickness and areal distribution of the uppermost Cape May aquifer. The Cape May unconformably overlies the Potomac-Raritan-Magothy aquifer system and is separated from the latter by an extensive confining unit. The overall thickness of the two aquifer systems combined is greater than 130 feet at the PSF site; the Cape May aquifer attains a thickness of 30 feet, while the Potomac-Raritan-Magothy exceeds 100 feet in thickness. In the vicinity of PSF, the Cape May's thickness ranges from 15-35 feet.

All groundwater monitoring wells and piezometers on-site were completed within the top of the Cape May aquifer. The water table depth averages 3.25 feet bgs with a total saturated thickness of approximately 27 feet. Changes between

high and low tide of the Delaware River have not been observed to have any significant effect on water table elevations at the site. The aquifer is recharged via precipitation and subsequent infiltration in the range 0.7-1.3 feet per year. The underlying Cretaceous aquifer is recharged via precipitation only where local confining clays are absent, and where the Cape May and Potomac-Raritan-Magothy are hydraulically connected. Reported laminated sand lenses developed in the uppermost Cretaceous section are representative of the locations where local confining clays may be absent. No apparent sand lenses were observed on the site during drilling activities, thus no recharge of the underlying aquifer system appears to occur at the PSF site.

The surface and subsurface features on either side of the PSF site have significant effects on the configuration of the local water table. The Pedricktown North and South dredged materials located north and east of PSF are composed primarily of silt; therefore, very little or no recharge of the Cape May aquifer occurs where these dredged materials overlie the Cape May. The dredged materials, located along the Delaware River, are approximately 15-20 feet thick and cover 1200 acres overall (Figure 2.5). The Cape May aquifer was partially excavated directly southwest of the site, resulting in the formation of the Penns Grove man-made lake. This area is hydrogeologically separated from the PSF site by a buried, 11,000 foot long slurry cut-off wall surrounding the outer boundaries of the lake. The slurry wall extends 20-60 feet deep and is approximately 3 feet wide. It acts a no-flow boundary (K=2.83 X 1E-4 ft/day) for groundwater flow between PSF and the Penns Grove lake area. Groundwater that flows toward the slurry wall nearest PSF is diverted and travels around the cut-off wall. FLOWPATH™, chosen as the groundwater model for PSF, graphically illustrates the slurry wall's effect on the local groundwater flow (see velocity distribution maps in Appendix C).

Further north along the Delaware River, overlying the Cape May, a thin band of Holocene alluvium developed. These alluvial deposits have no apparent hydrogeological effect on the PSF site itself, but probably affect hydraulic conductivities in the aquifer segments proximal to the river.

2.5.2.3 Hydraulic Conductivity

On July 8, 9, 12, and 20, 1993, rising-head slug tests were conducted at the PSF site to determine the hydraulic conductivity of the unconfined aquifer system underlying the site. The slug tests were performed on 19 monitoring wells and 3 piezometers, utilizing a pressure transducer, Hermit 1000c data logger, water

level measurement indicator, and 2 and 4 inch slugs. Geraghty and Miller's AQTESOLV computer program was used to compile, plot, and interpret the time vs. drawdown slug test curves.

Rising-head slug tests were performed to measure the wells' recovery or recharge rate, i.e., the time needed for the decreased pressure head of water to return to a static condition. The test is performed by introducing and then removing a slug from each monitoring well, thus simulating the removal of a known volume of water. As the head change occurs within a pre-determined radial distance from the well, the resulting rise in water level over time is useful in evaluating aquifer characteristics and calculating its hydraulic conductivity and transmissivity.

Instantaneous recharge rates were monitored in each well/piezometer using a pressure transducer placed at a determined number of feet below the pre-test static water level. Fluctuations in water surface elevation were recorded on the data logger and later down-loaded onto an IBM computer for analysis. The recharge rate was measured until greater than 95% recovery was attained. All field data and procedures were properly recorded in the site logbook. Decontamination of the equipment was conducted between test locations to avoid possible cross-contamination.

Field testing activities were performed using the following procedures:

- Measure the static water level in the well.
- Decontaminate oil/water interface probe, slug, and transducer cable.
- Place the pressure transducer probe down the well at a pre-determined number of feet below the static water level.
- Place the slug near the bottom of the well.
- Wait for the groundwater to equilibrate back to static levels.
- Set the data logger to automatically record instantaneous changes in pressure head vs. time.
- Quickly remove the slug, without disturbing the pressure transducer probe.
- The data logger records the water level changes until static levels are reached again.
- Decontaminate all down-hole instruments and begin again on the next well.

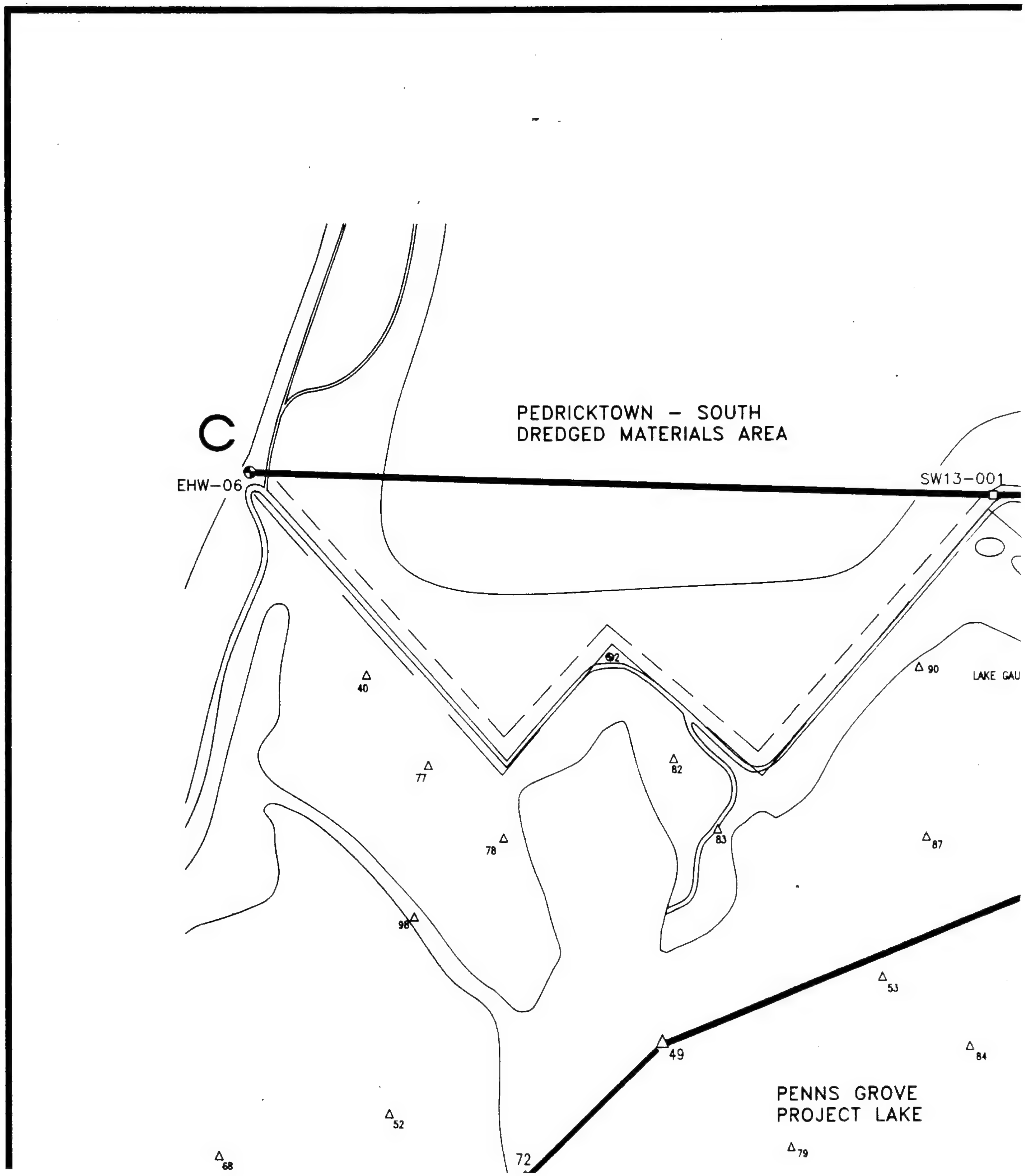
The slug test data were interpreted using the Bouwer-Rice Method for unconfined aquifers. This method measures the saturated hydraulic conductivity of aquifer material with a single well. It consists of lowering or raising the water level in a well or borehole from equilibrium and measuring its subsequent rate of rise or fall. The following parameters were entered as prompted by the program: initial drawdown in well, radius of well casing, radius of well, aquifer saturated thickness, well screen length, and static height of water in well. After all data were entered, the program generated a time vs. drawdown curve and produced a best fit straight line slope to the time-drawdown curve. Hydraulic conductivities are then determined by the AQTESOLV program using the Theis equation.

Curve matching requires judgment due to the effect of filter packs on slug test results. The correct portion of the time-drawdown curve must be selected to properly measure aquifer hydraulic conductivity. A double-straight line phenomenon is sometimes observed in aquifer slug test data when the surrounding gravel pack is coarser than the surrounding aquifer material. When this occurs, the initial line of the curve is disregarded and the later time-drawdown data are simply selected to represent the true flow of the aquifer into the well. At PSF, only the curve graphed for MW21-001 illustrated a double-straight line effect. All of the data from the remaining wells/piezometers produced smooth curves, thus complicating the selection of a best fit time-drawdown slope line.

A sensitivity analysis was then manually conducted by varying the weighing of time-drawdown data and matching lines to separate sections of each curve. Two different line segments of the curve were matched by this method. After performing the sensitivity analysis, it was observed that a conductivity difference of one order of magnitude existed between the two plots completed for each slug test. The hydraulic conductivities summarized in Table 2.1 were calculated from the selected time-drawdown graphs presented in Appendix D. The early time-drawdown data were selected as most representative in hydraulic conductivity interpretation for several reasons:

- Gradation curves from PSF sieve analysis of the Cape May formation indicated similar median grain sizes for the aquifer and filter pack materials. Therefore, no double straight line effect was evident in the time-drawdown curve.

- The higher hydraulic conductivities calculated in the sensitivity analysis produced data consistent with USCS soil classifications and well development observed in the PSF monitoring wells.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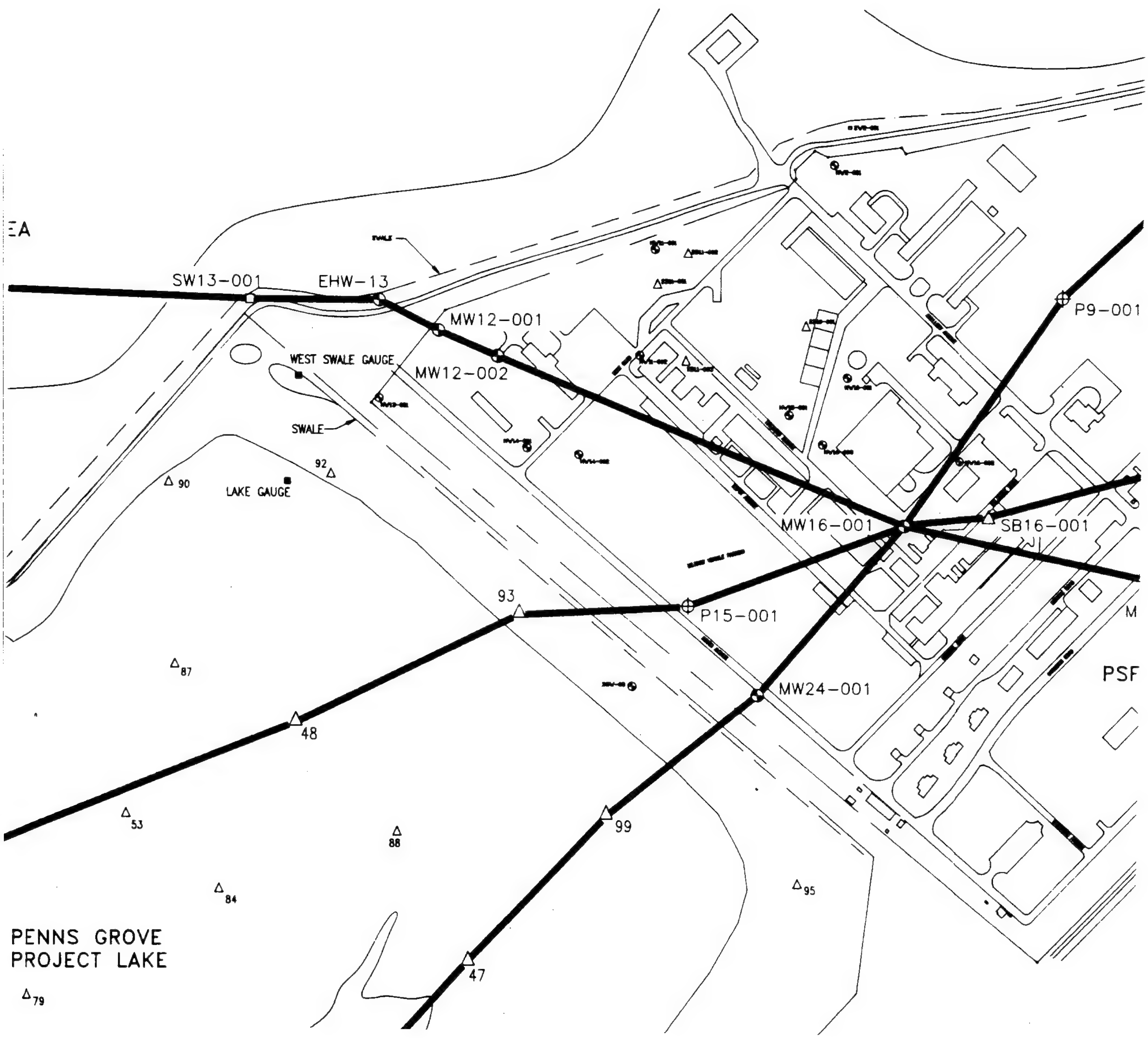

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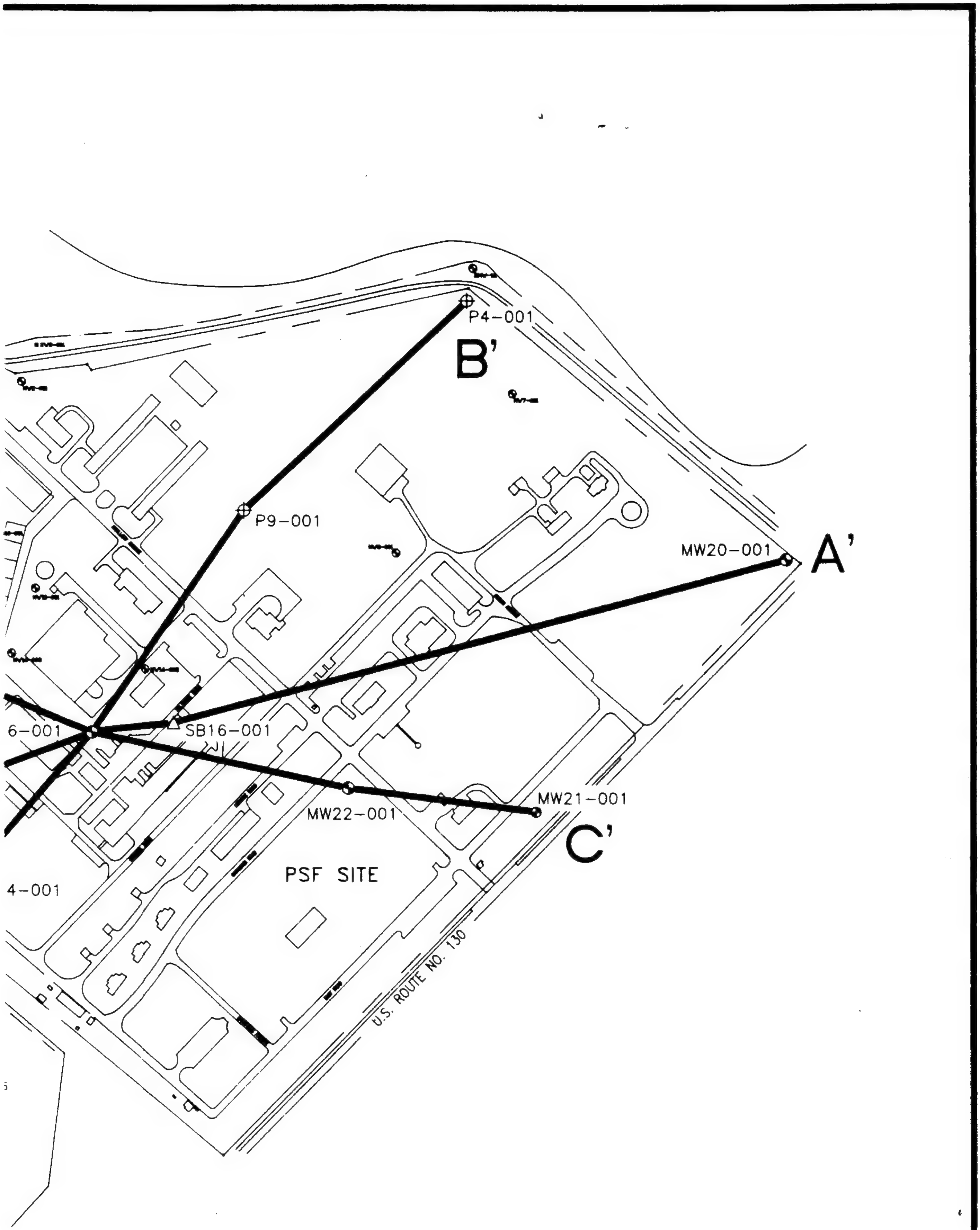

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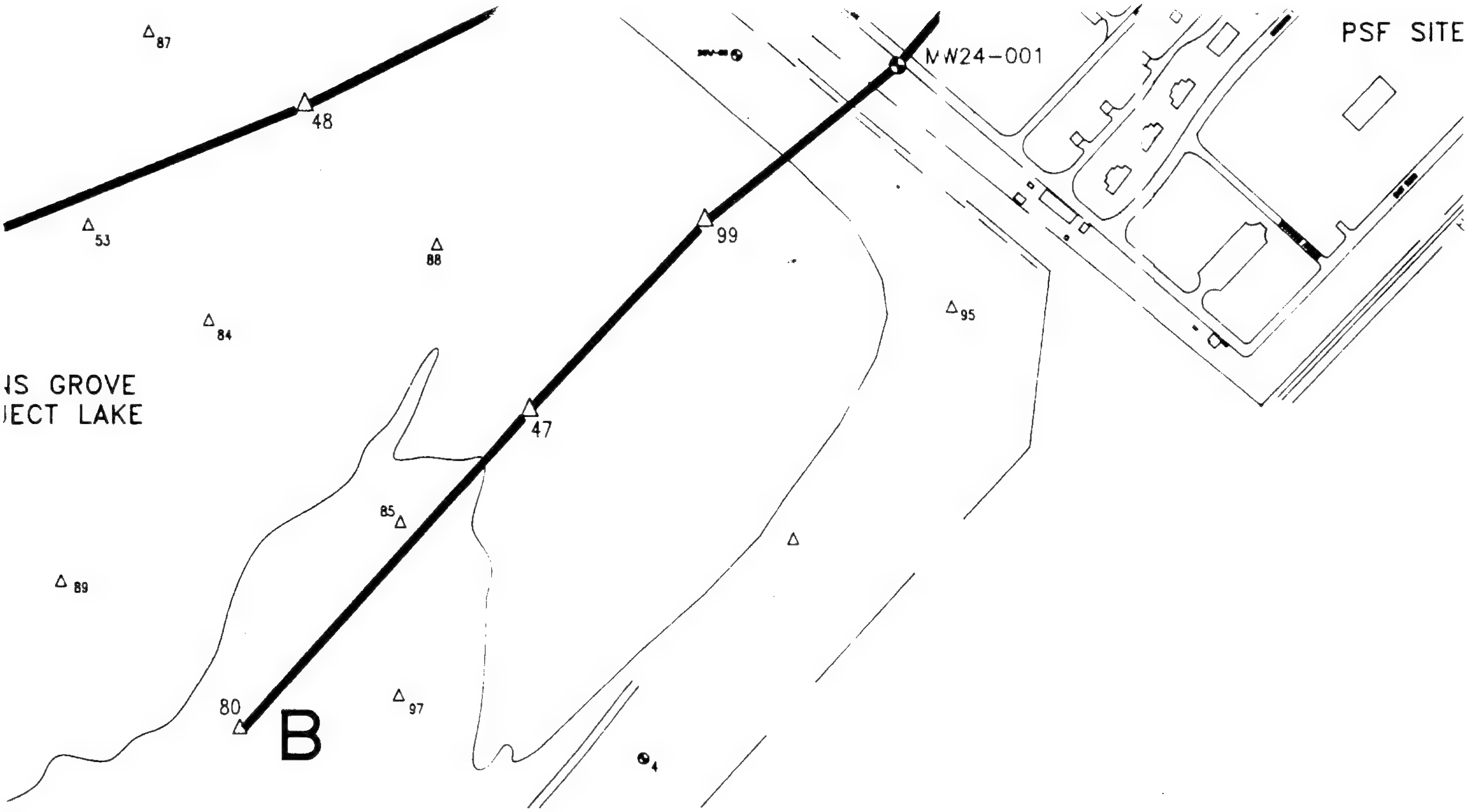
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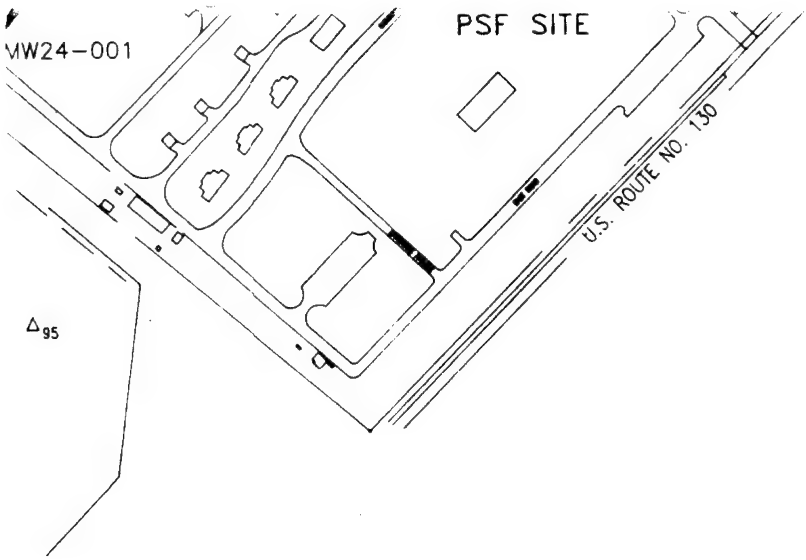


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**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

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Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

FIGURE 2.2
CROSS-SECTION LOCATION MAP

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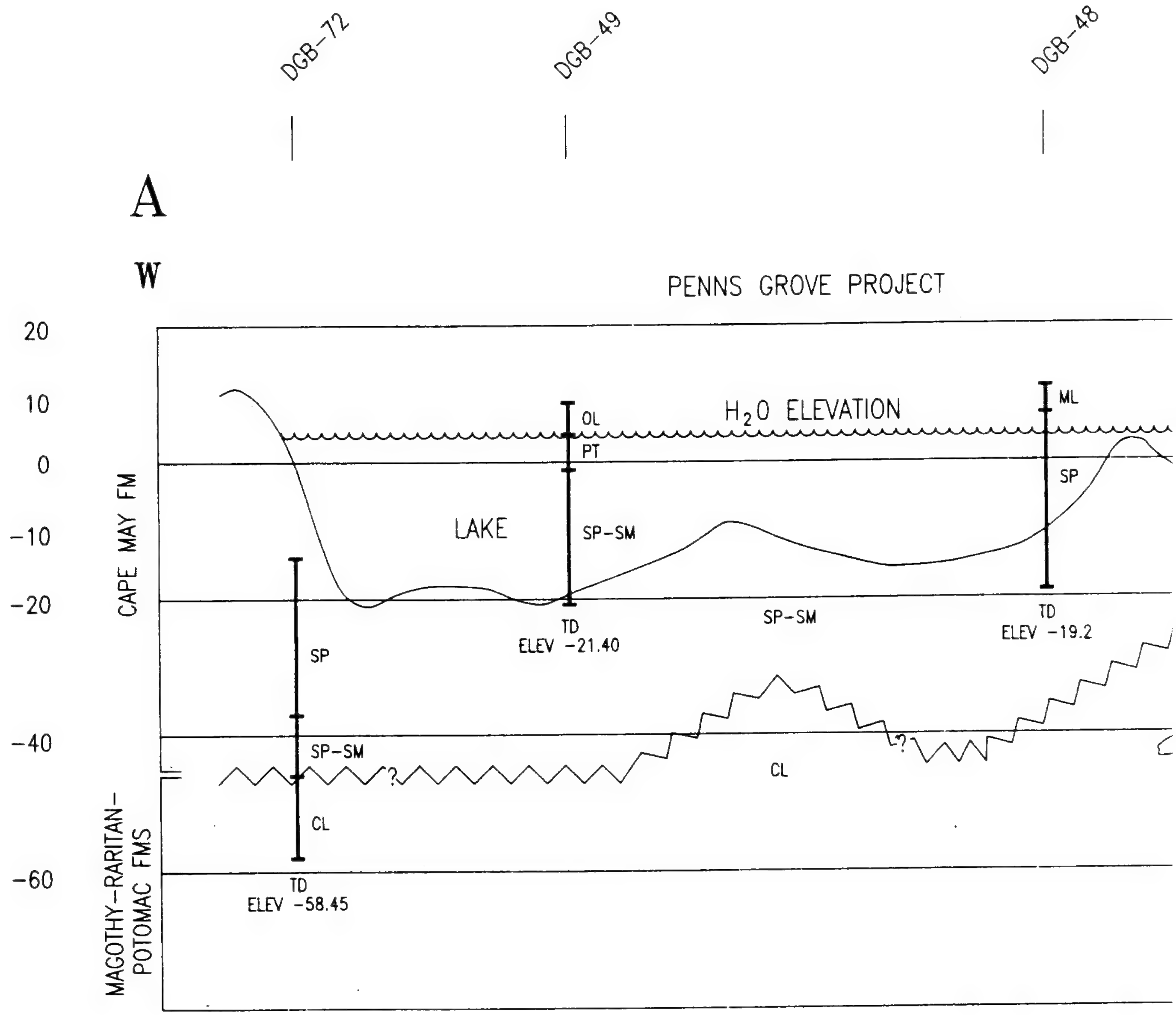


## LEGEND

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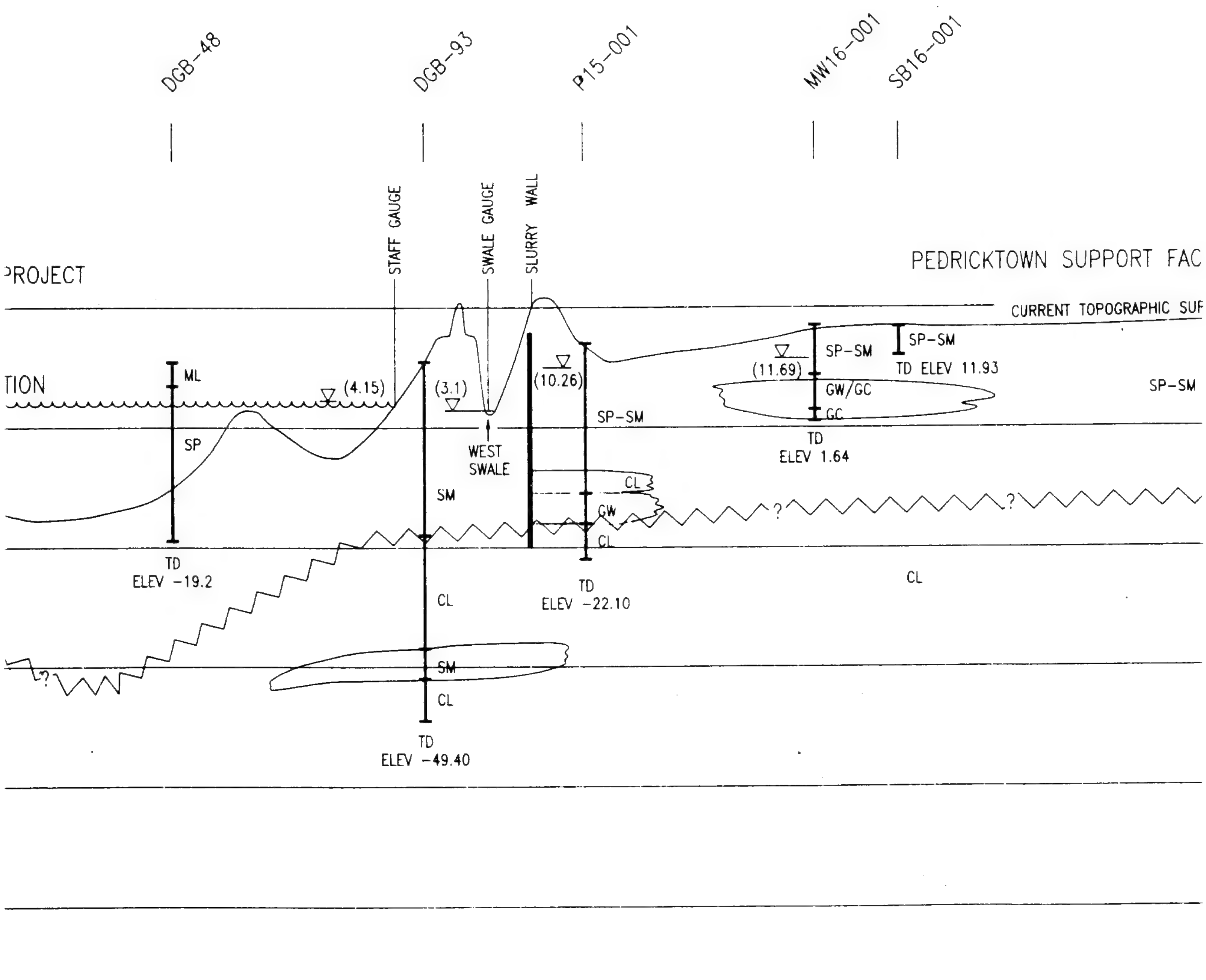
NOTE — INFORMATION ON THE LOCATION OF THE TOP OF PENNS GROVE PROJECT.

# CROSS-SECTION A-A'

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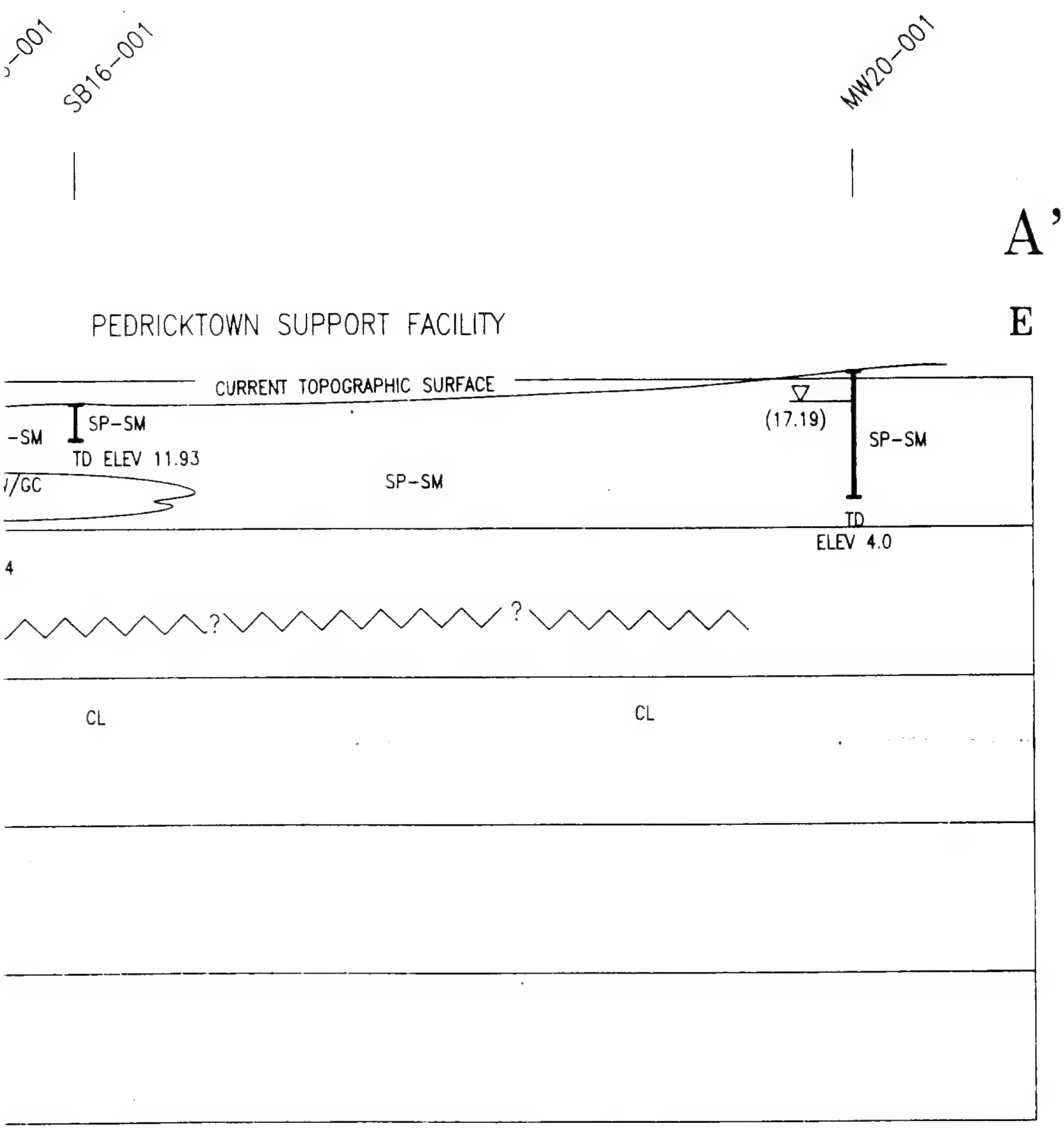

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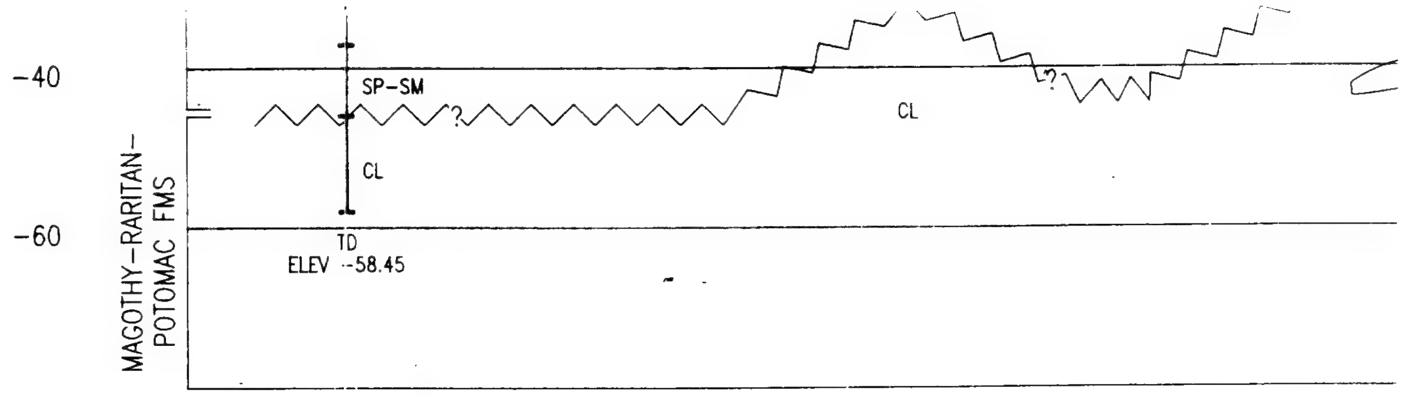


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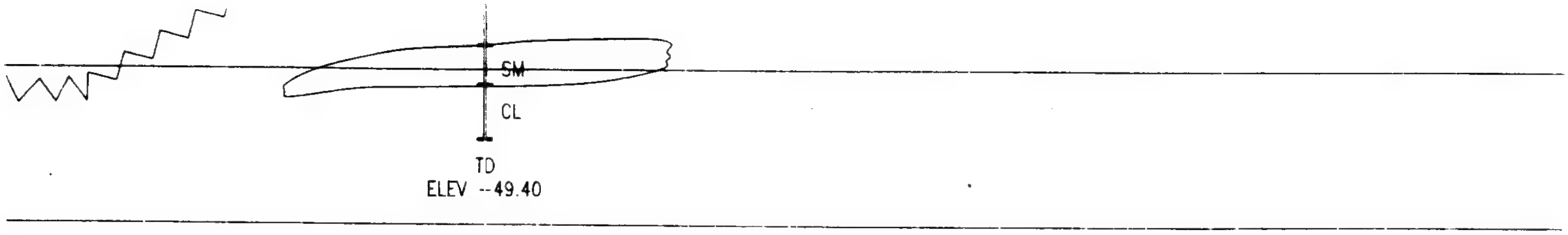
NOTE — INFORMATION ON THE LOCATION OF THE TOP OF TH PENNS GROVE PROJECT.

UNIFIED SOIL CLASSIFICATION SYSTEM DEFINITIONS:

GW — WELL-GRADED GRAVELS OR GRAVEL
GP — POORLY GRADED GRAVELS OR GRAV
GM — SILTY GRAVELS, GRAVEL-SAND-SILT
GC — CLAYEY GRAVELS, GRAVEL-SAND-CL
SW — WELL GRADED SANDS OR GRAVELLY
SP — POORLY GRADED SANDS OR GRAVE
SM — SILTY SANDS, SAND-SILT MIXTURES
SC — CLAYEY SANDS, SAND-CLAY MIXTUR




:LEVATION IN FEET ABOVE MEAN SEA LEVEL. WATER LEVELS WERE MEASURED ON 6/28/93 AT HIGH TIDE.

:VATION OF WELL OR BORING IN FEET ABOVE OR BELOW MEAN SEA LEVEL.

ETWEEN THE PLEISTOCENE CAPE MAY FORMATION AND THE CRETACEOUS MAGOTHY-RARITAN-POTOMAC FORMATIONS.

THE LOCATION OF THE TOP OF THE CRETACEOUS UNCONFORMITY WAS TAKEN FROM PREVIOUS MAPS COMPLETED ON THE
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;TEM DEFINITIONS:

WELL-GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OR NO FINES
POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES.
CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.
WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
SILTY SANDS, SAND-SILT MIXTURES.
CLAYEY SANDS, SAND-CLAY MIXTURES

ML — INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
CL — INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CL SILTY CLAYS, LEAN CLAYS.
OL — ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY.
MH — INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS,
CH — INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH — ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
Pt — PEAT OR OTHER HIGHLY ORGANIC SOILS.


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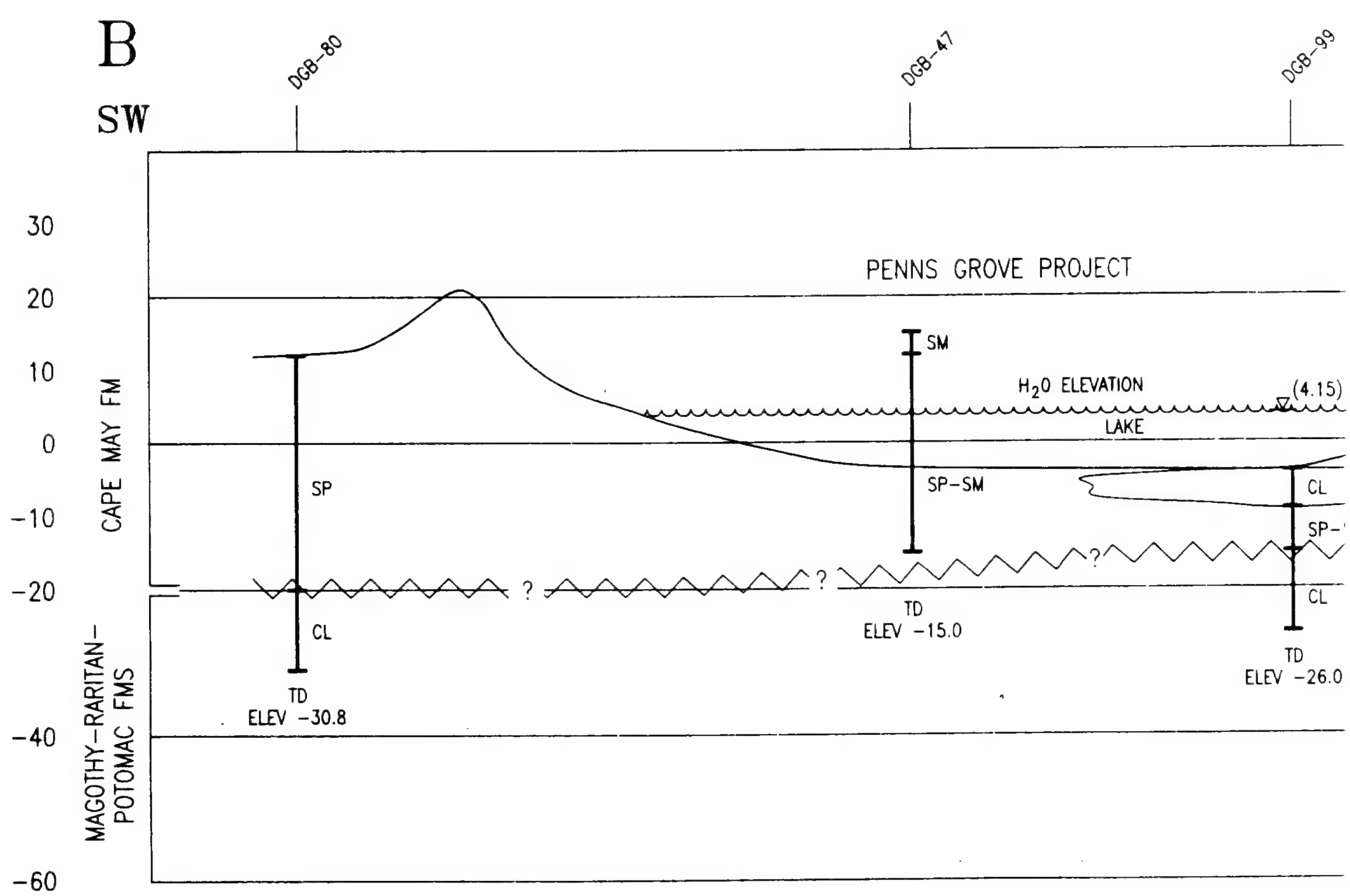
# FIGURE 2.3
CROSS-SECTION A-A'

PROJECT NO. 2060.000 SCALE NOTED

# CRO



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DGB-47
DGB-99
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MAGOTHY-RARITAN-POTOMAC FMS
PENNS GROVE PROJECT
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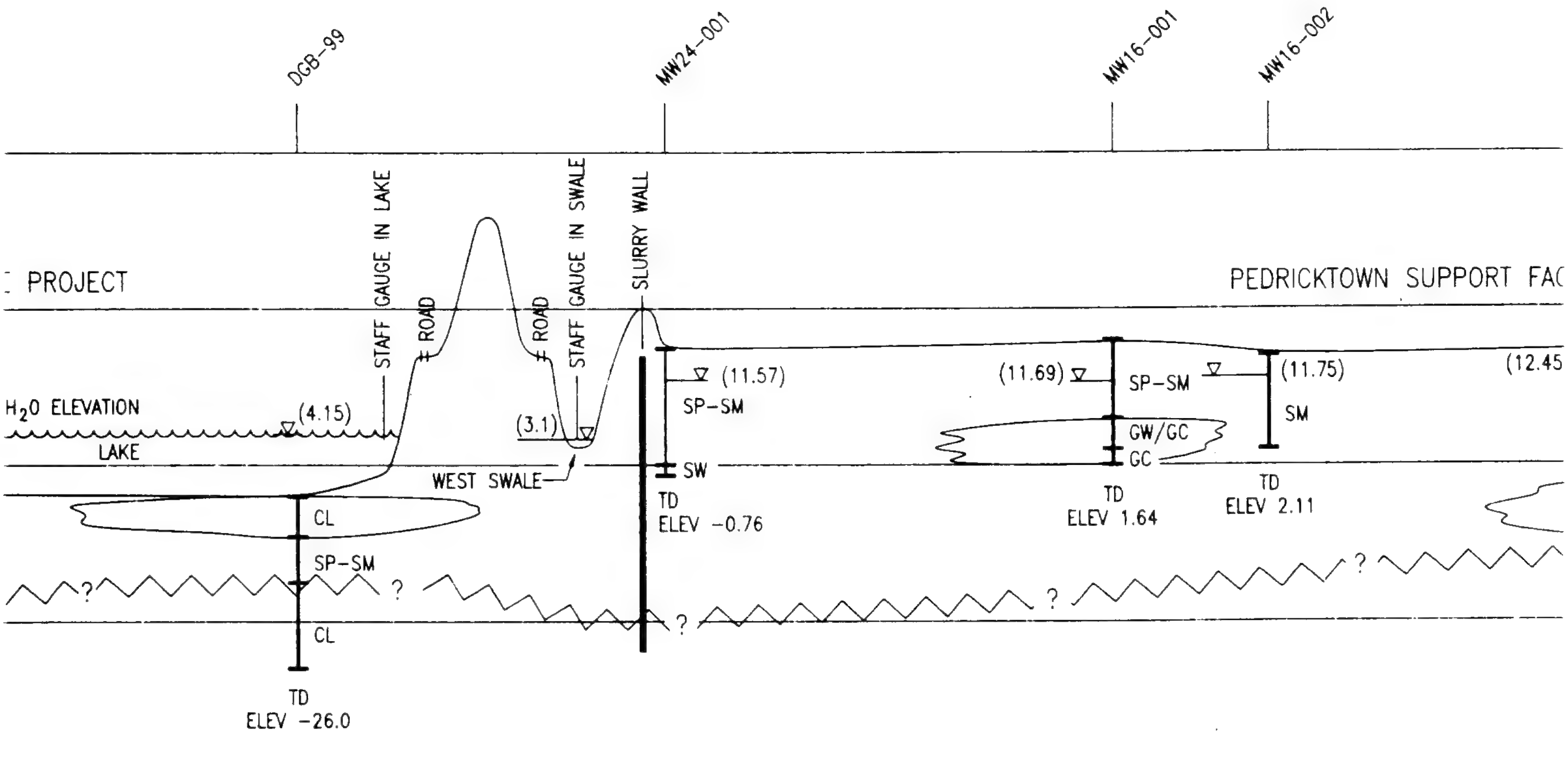
# CROSS-SECTION B-B'



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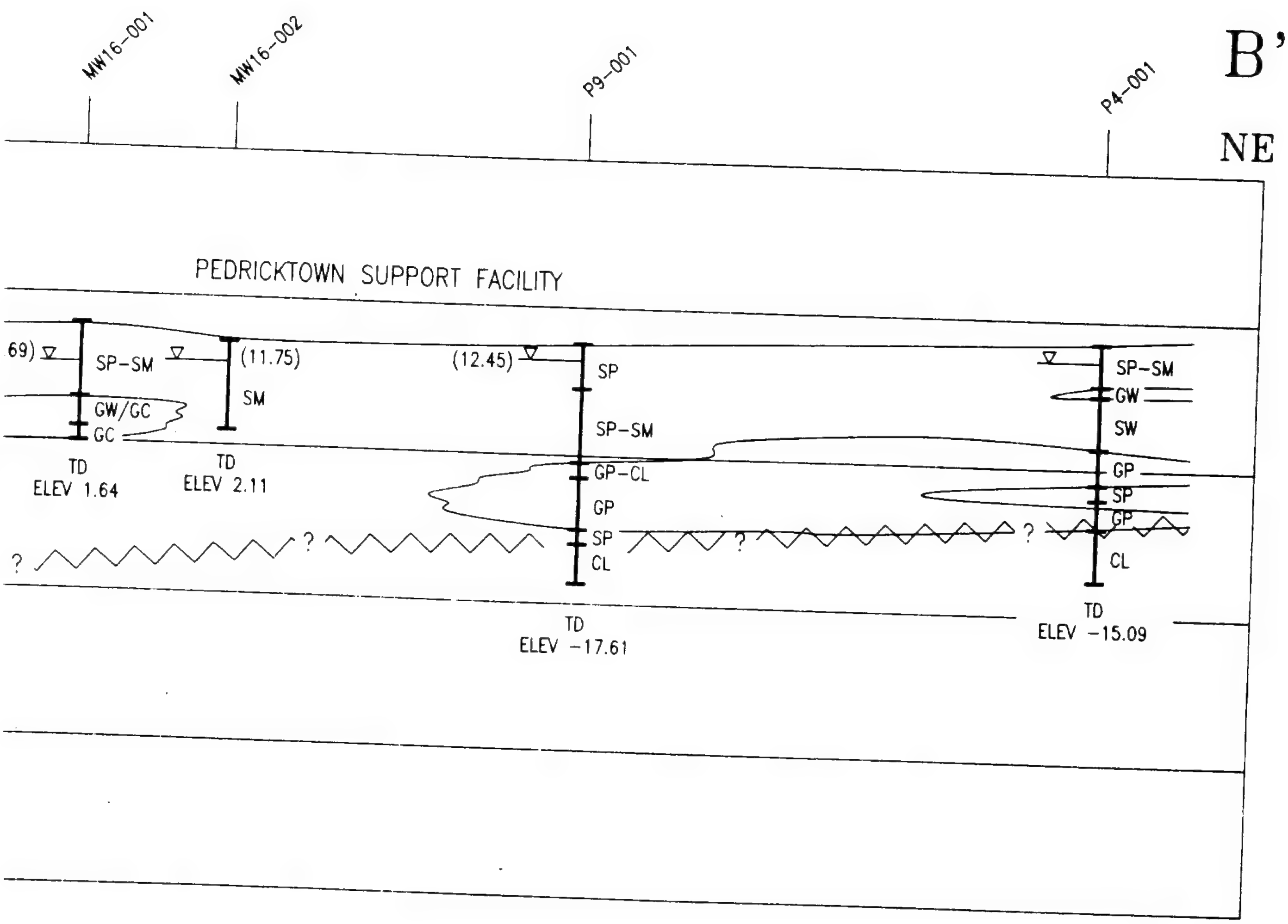
MW16-001
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# LEGEND

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SM — SILTY SANDS, SAND-SILT MIXTURES.
SC — CLAYEY SANDS, SAND-CLAY MIXTURES

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ML — INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.

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Pt — PEAT OR OTHER HIGHLY ORGANIC SOILS.

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HORIZONTAL SCALE

)R CLAYEY FINE SANDS,

_AYS, SANDY CLAYS,

)R SILTY SOILS, ELASTIC SILTS.

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FIGURE 2.4

CROSS-SECTION B-B'

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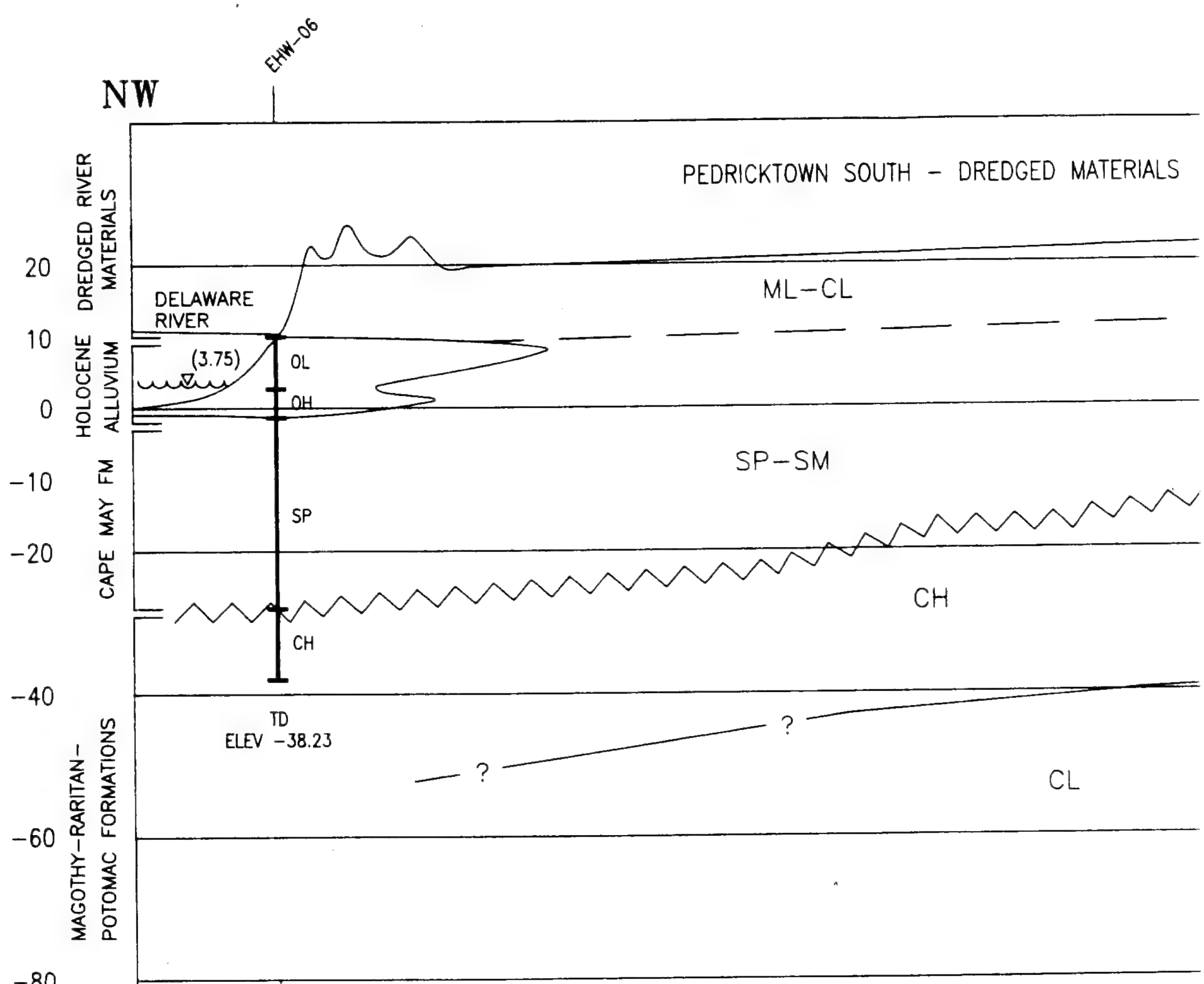
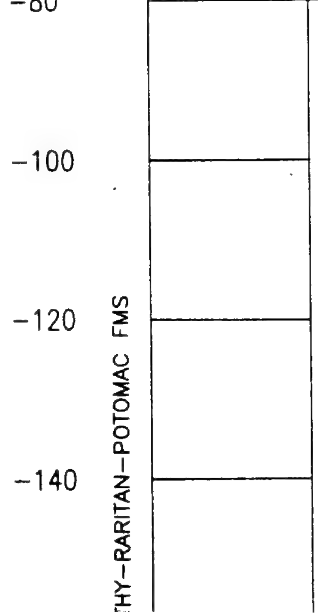
C

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∇ (11.57) — GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL. WATER LEVELS WERE MEASURED ON 6/28/93 AT HIGH TIDE.

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﹏﹏ — UNCONFORMITY BETWEEN THE PLEISTOCENE CAPE MAY FORMATION AND THE CRETACEOUS MACOTHY-RARITAN-POTOMAC FORMATIONS.

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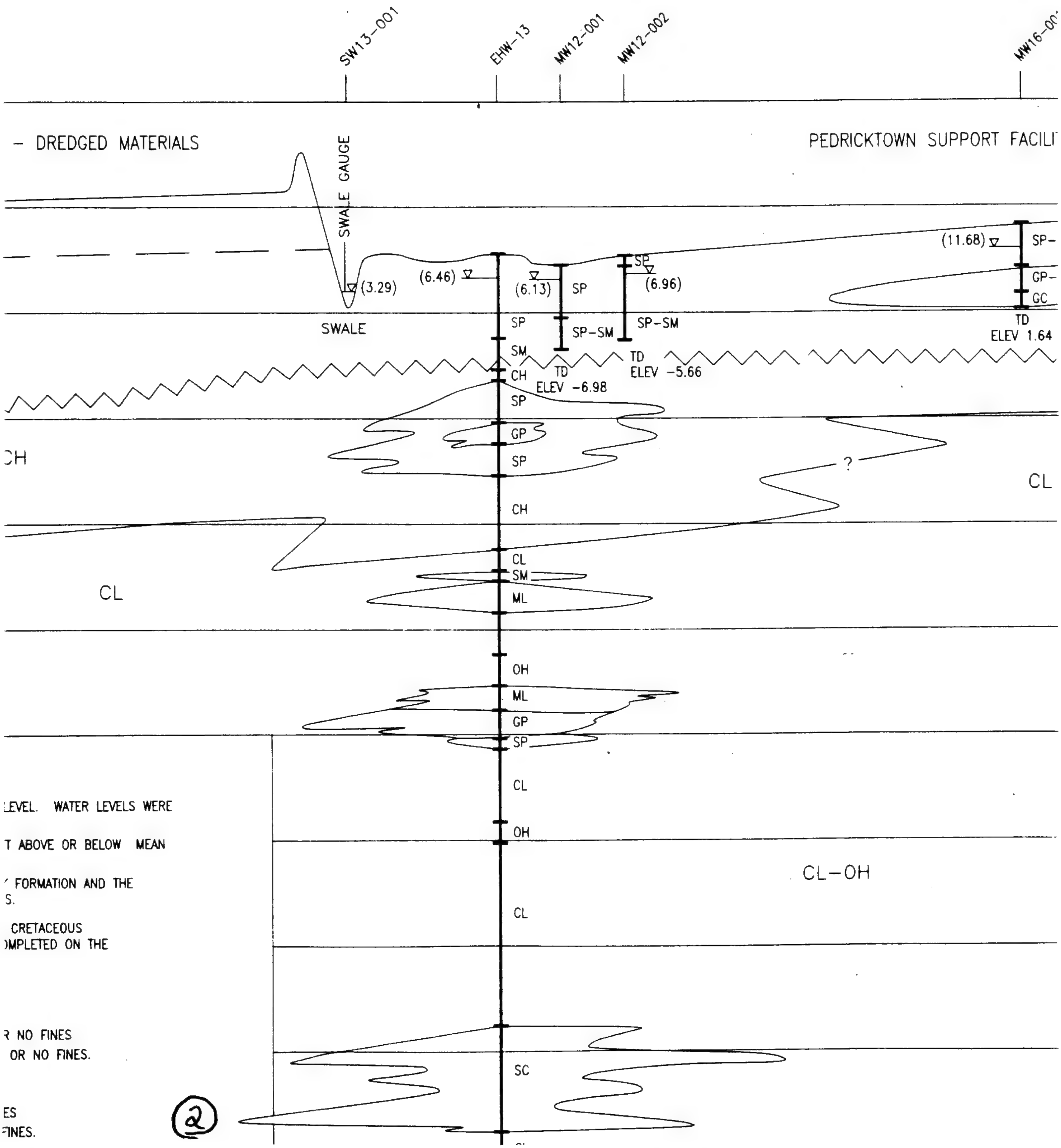
# CROSS - SECTION C - C'

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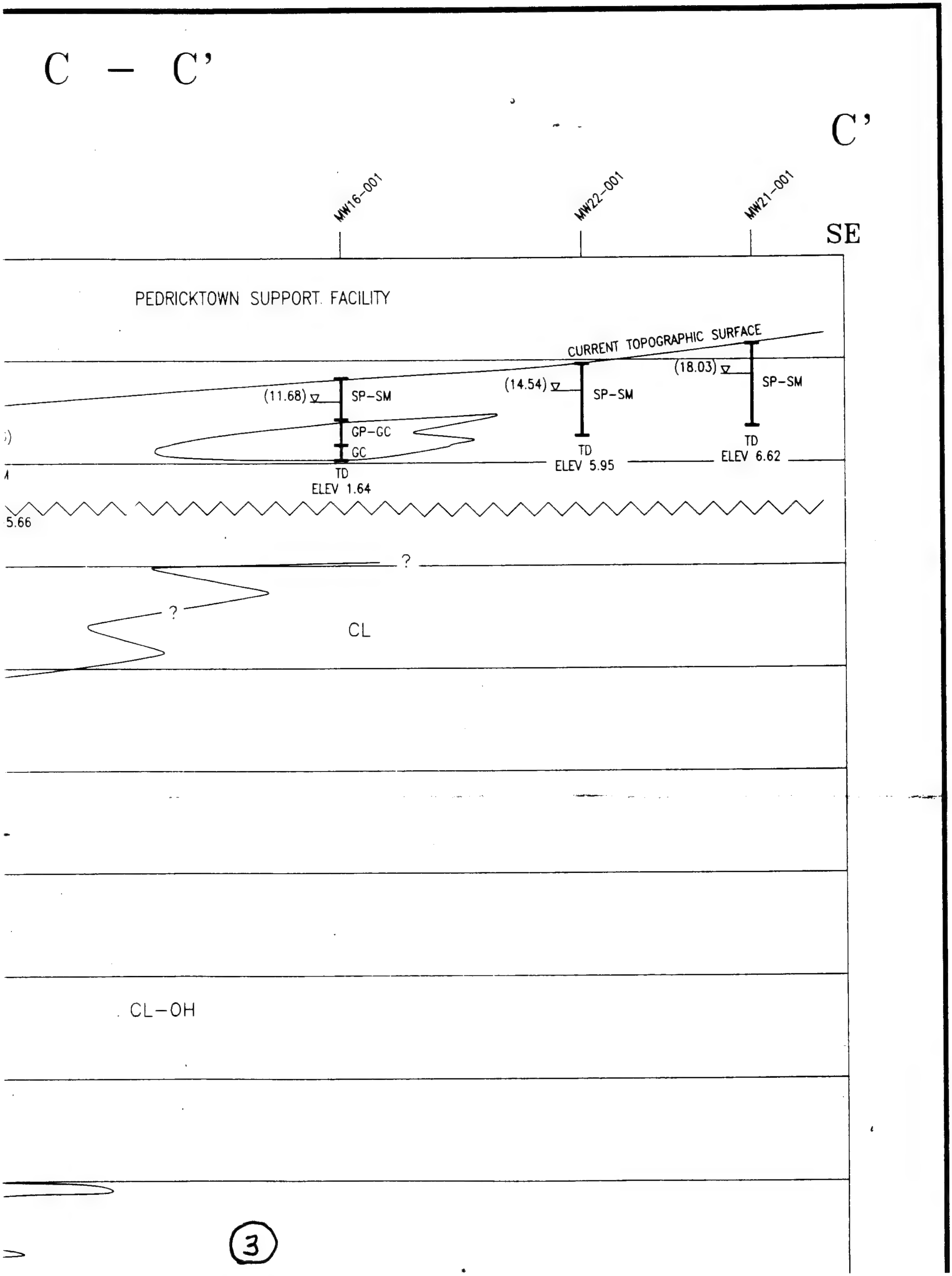
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MW16-001
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MAGOT POTOM

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OR SILTY SOILS, ELASTIC SILTS.

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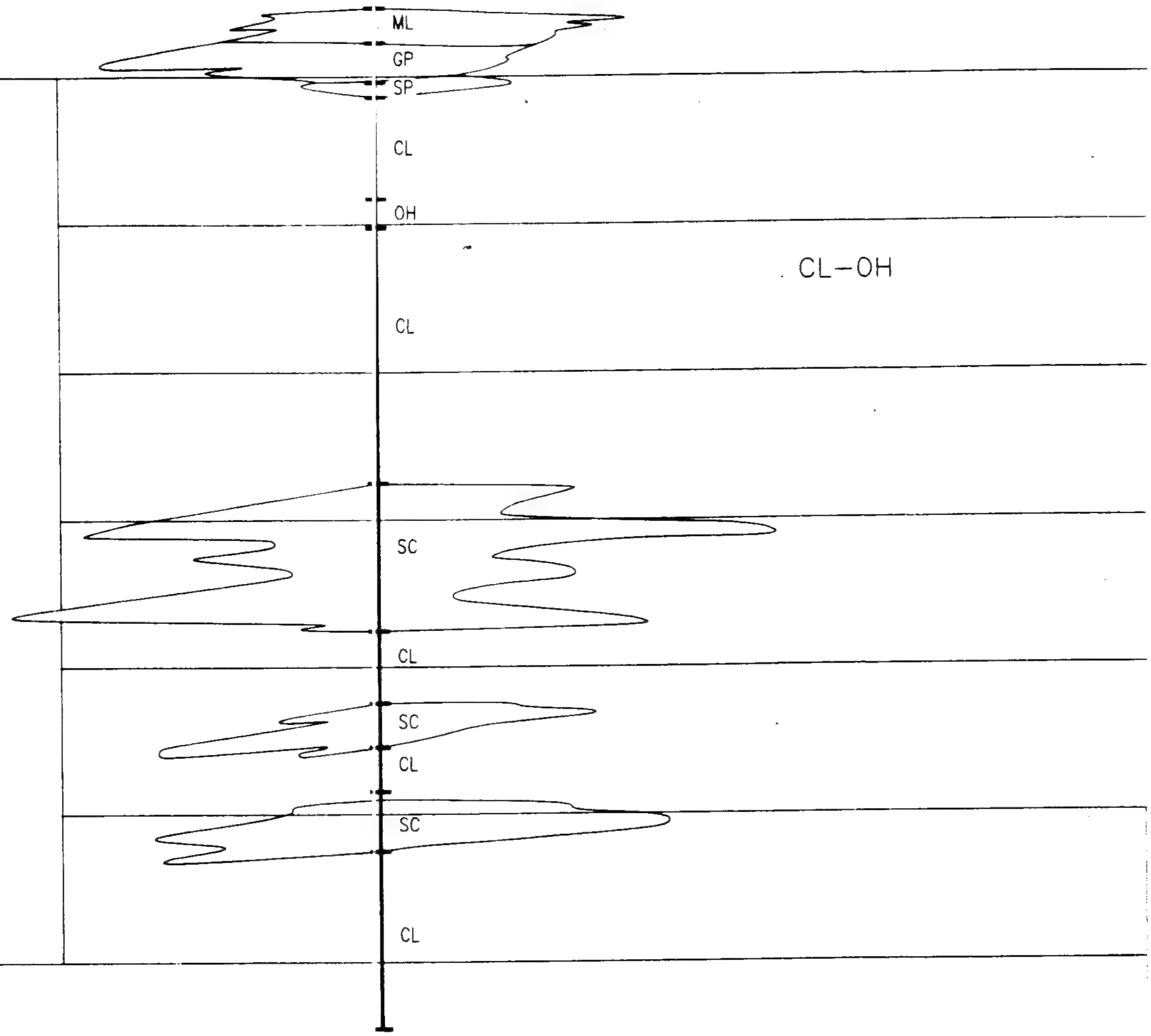


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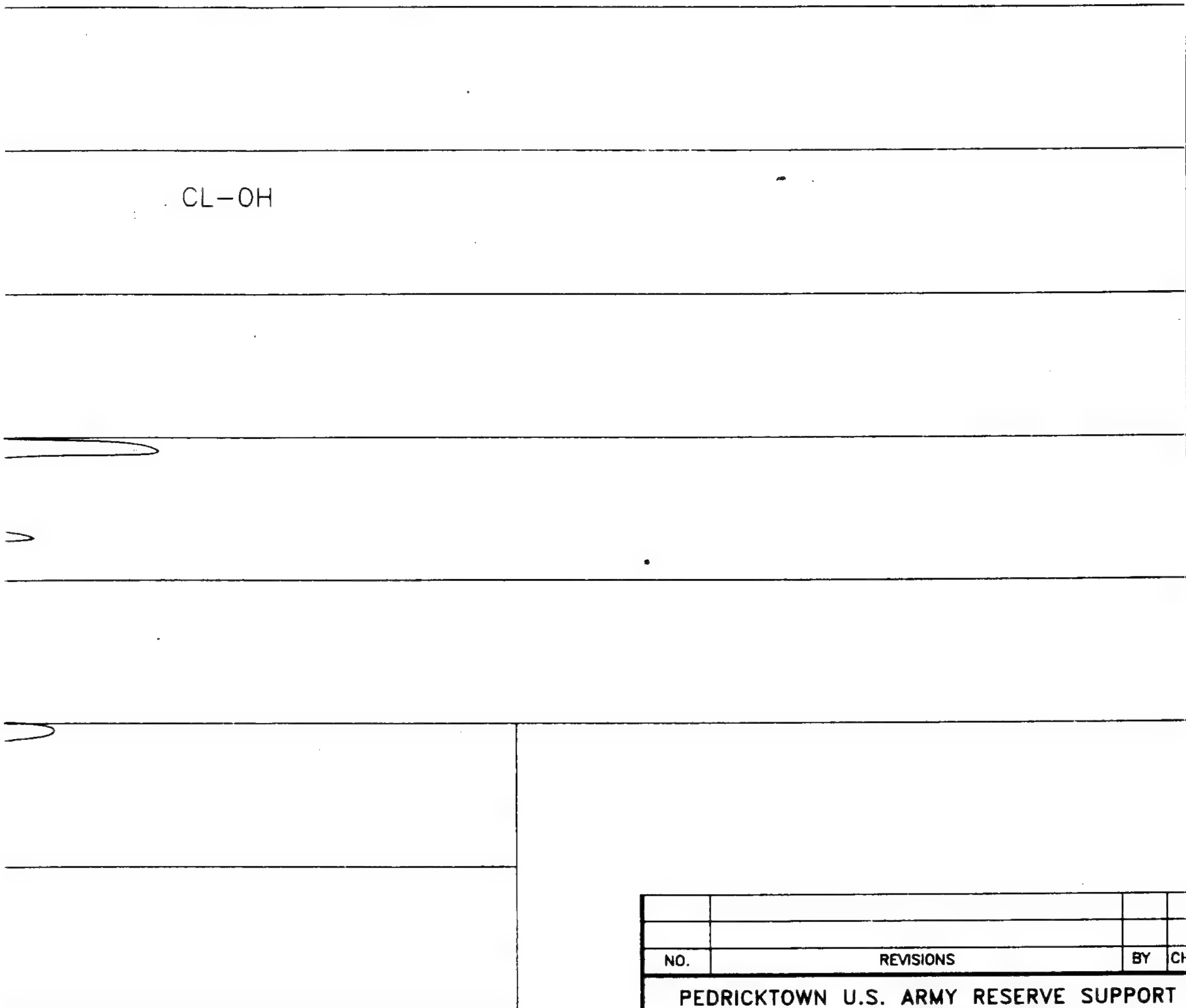


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**FIGURE 2.5**

CROSS-SECTION C-C'

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Hydraulic conductivities at the PSF site ranged between 1.34 to 31.72 ft/day with an average transmissivity of 392 $ft^2$/day. Figure 2.8 depicts the locations of each monitoring well/piezometer with its corresponding hydraulic conductivity value. All conductivity values for the PSF site fall within the specified range for soils designated as SP-SM. According to the USCS, soils designated as SP-SM should have a hydraulic conductivity value between 2.83 X 10E+1 to 2.83 X 10E-3 ft/day. Conductivity values were observed to fall within three different ranges; 1-10 ft/day, 10-20 ft/day, and >20 ft/day. These ranges are depicted on Figure 2.8 as concentric circles of varying size. It was also observed that the conductivity increased from the southwest portion of the site to the northernmost portion of the site, with median conductivities existing in the western and eastern corners of PSF.

The calculated conductivities shown in Table 2.1 may be conservative values. The slug test technique does have drawbacks: a) The computed value of hydraulic conductivity is accurate only to within an order of magnitude; b) storage coefficient cannot be satisfactorily determined; c) no closed-form analytical solution yet exists to solve for hydraulic conductivity in unconfined aquifers; d) tests can be strongly affected by skin effects, wellbore storage, and filter pack problems; e) the aquifer volume affected during the test is small, so hydraulic conductivity values can be applied only locally; and f) in highly transmissive aquifers, the recovery rate can be so rapid that manual slugging, via solid slugs, bailers, or injected water, can cause significant "noise" in the very-early-time data, which can lead to erroneous interpretations of that data set. For these reasons, it is assumed the hydraulic conductivities at the PSF site could be slightly higher than shown. This assumption is discussed relative to impacts on groundwater flow modeling in Section 5.3.

The groundwater model calculated groundwater velocities at PSF to have an average of 3.55 x 10E-1 ft/day. The groundwater velocities determined from the water table and hydraulic conductivity maps were calculated to have an average velocity of 3.32 x 10E-2 ft/day. Because the average velocities calculated by these two methods are similar, the groundwater velocities calculated by the model are assumed to be representative of the actual conditions at the PSF site (Appendix C).

2.5.2.4 Hydraulic Gradient

Synoptic water level measurements were taken from the north side of the top of each PVC well/piezometer casing and at each surface water staff gauge to ±0.01 feet, using a water level indicator. Measurements were taken on two separate occasions, at both high and low tide, on June 28 and September 2, 1993. Elevation data are summarized in Tables 2.2 and 2.3 and depicted in the Groundwater Flow Direction Maps, Figures 2.9 and 2.10. Figure 2.9 shows the high tide water level measurements and flow direction in June 1993. Water levels taken at low tide on the same day were very similar, showing no significant change in flow direction or contouring, and therefore were not mapped. Figure 2.10 depicts the water level measurements collected at low tide in September 1993. High tide measurements on the same day also showed little or no change and also were not mapped. The change in groundwater elevations from season to season, however, is presented by comparison of the two figures.

Comparing the Groundwater Flow Direction Maps, it is evident from the groundwater contour spacing that both the hydraulic gradient and flow direction differ slightly in the western and eastern portions of the site. Measurements taken during high tide on June 28, 1993, revealed groundwater elevations of 17.19 feet above msl in MW20-001 and 8.53 feet above msl in MW2-001, producing a 0.41% westward groundwater hydraulic gradient on the eastern portion of the site. The same round of measurements also revealed an approximate groundwater elevation of 13 feet above msl in the southern corner of PSF and an elevation of 6.06 feet above msl in MW13-001, indicating a 0.32% northwestward gradient on the western portion of the site.

Before the installation of the bentonite slurry wall along Penns Grove's eastern property boundary, the groundwater flow direction and gradient were probably more uniform throughout PSF and the surrounding properties. The lower hydraulic gradient and the refraction of flowpaths on the western portion of the site is due to the diversion of groundwater around the slurry wall and the presence of slightly higher hydraulic conductivities in that area. The groundwater model calibration map, derived from the FLOWPATH groundwater modeling efforts, depicts an overall view of the local flow patterns and hydraulic gradients. This figure is discussed in further detail in Section 5.3.

Hydraulic gradients from PSF to the Delaware River are lower than on-site, during both high and low tide flow regimes. At low tide, the hydraulic gradient

from the northwest portion of PSF to the river is approximately 0.23%. At high tide, it appears that the gradient is close to flat.

2.5.2.5 Groundwater and Surface Water Relationships

The uppermost aquifer at the PSF site is that within the unconfined Pleistocene Cape May formation. The water levels measured within the well/piezometers completed in this aquifer indicate the water table currently fluctuates between approximately 2-6 feet bgs from June to September. Overall, elevations (at high tide, June 28, 1993) of the water table were measured from 18.03 feet above msl along the southeastern side of the site (MW21-001), to 6.06 feet above msl (MW13-001) at the northwest corner. Groundwater Flow Direction Maps (Figures 2.9 and 2.10) show the water table elevations at each sampling location. As discussed above, a 0.41% westward groundwater hydraulic gradient is produced on the eastern portion of the site and a 0.32% northwestward gradient on the western portion.

Staff gauges were placed within the nearby surface water bodies in order to discern the connections between the water table and surface water and the relationships involved. Gauges were placed in both the north and west swales, the Penns Grove Project lake, and the Delaware River. The elevations along the north drainage swale were 7.65 feet above msl (SW2-001) and 3.29 feet above msl (SW13-001) during the June 28, 1993, round of measurements. The gradient of the surface water within the north swale was calculated to be 0.27% from SW2-001 to SW13-001.

It is evident from comparison of the water table and surface water elevations that the north swale is a gaining stream, at least along the portion from SW2-001 to the river. Corresponding measurements at MW2-001 and SW2-001 indicate only a 0.5 foot difference in water elevations at low tide on September 2, 1993. Corresponding measurements at EHW-13 and SW13-001 indicate a 2.27 foot difference in water elevations at the same measurement round. No measurements were taken east of SW2-001, however, because visual observations indicate a lack of flow in this portion of the north swale. East of SW2-001, where flow is more consistent, the swale most likely is a gaining stream in the spring and a losing stream in the fall/winter.

The north drainage swale discharges directly into the Delaware River. From Versar's groundwater modeling efforts, as well as the geologic and hydrogeologic cross-sections created during this investigation, it is apparent that the Cape May aquifer discharges completely into the Delaware River as well. The deepest

navigable channel within the Delaware is approximately 40-45 feet below its water surface. From the borehole logs at both the Penns Grove and Pedricktown South sites, it is apparent that the Cape May's thickness nearest the Delaware River is approximately 15-35 feet. A small portion of the groundwater flow within the Cape May aquifer seeps into the north swale, and exits to the river via surface water flow, while the remaining groundwater flows under the Pedricktown South dredged materials and into the river from below the Holocene alluvium deposits (Figure 2.5).

Because of the installation of the bentonite slurry wall along the outside of the western border of PSF, groundwater within the Cape May does not exfiltrate into the Penns Grove Project lake nor into the west swale. Surface water runoff from PSF, however, can discharge into the west swale, which ultimately flows into the Delaware River after it joins the north swale. Surface water runoff from PSF cannot enter the Penns Grove Project lake on the west because of the intervening west swale and berm.

### 2.6 Geography

Salem County lies in the northwestern part of New Jersey and is located between 39°23'N and 39°48'N latitude, and 75°04'W and 75°34'W longitude. The county has a total area of 390 square miles, of which 45 square miles are covered by water. Salem County is bordered by Gloucester County on north, Cumberland County on the south and east, and the Delaware River and the State of Delaware on the west.

Salem County's relief is relatively low with gentle slopes. A tidal marsh which borders the Delaware River is 4 miles long and generally less than 10 feet above mean sea level. The land surface further inland rises gradually to gentle rolling hills. The highest elevation in Salem County is situated in the eastern part of the county, where altitudes reach 160 feet.

The county is drained by a series of streams, the largest of which is the Salem River. This river flows into the Salem Canal, which flows into the Delaware River. The Maurice River drains the land area in the far eastern portion of the county and flows southward through Cumberland County, to the Delaware Bay. All of the other major streams within Salem County discharge directly to the Delaware River.

### 2.6.1 Climatology and Meteorology

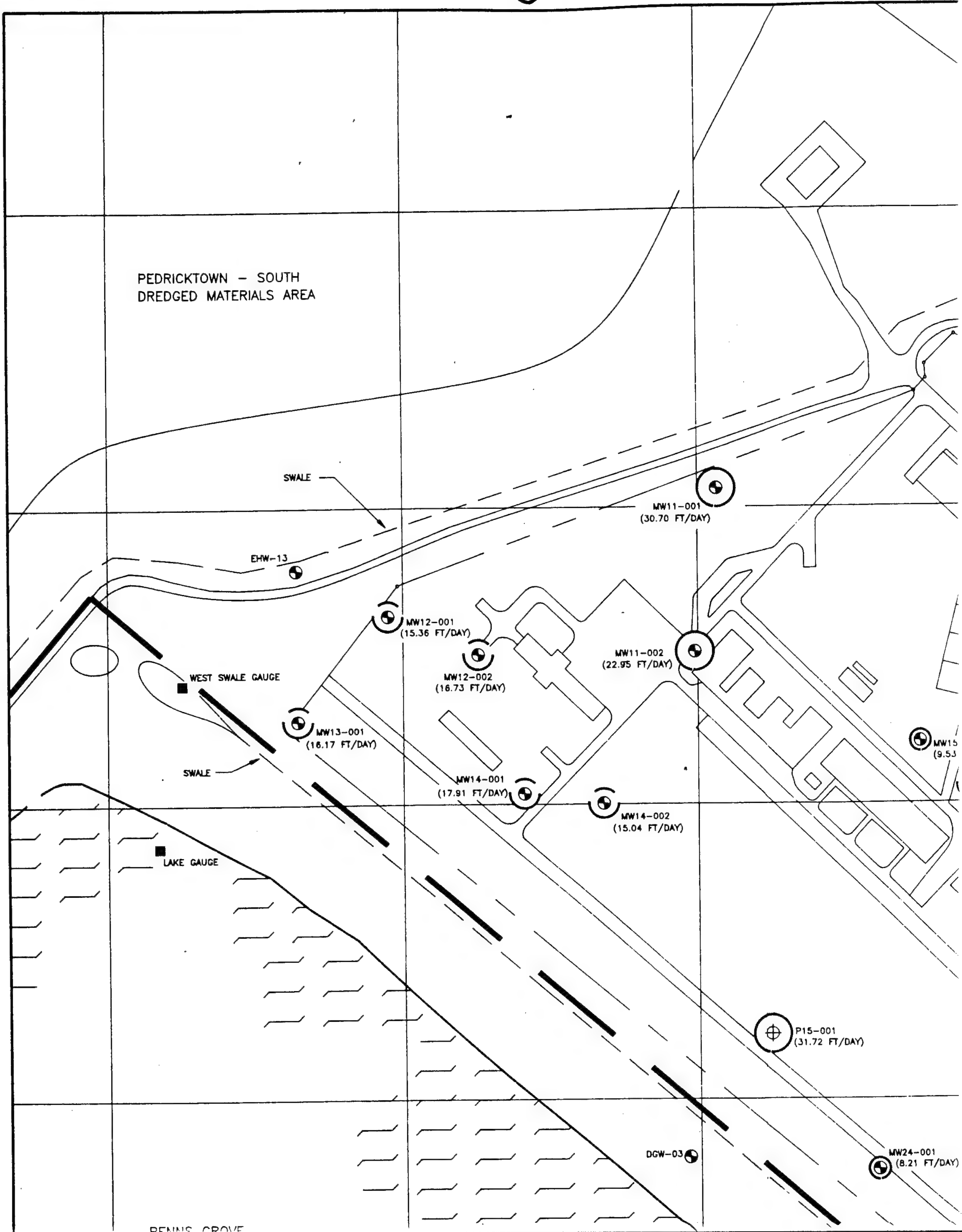
Salem County's climate is generally characterized by mild winters, warm humid summers, and moderate, evenly distributed precipitation. December through February is the coldest part of the year, with January generally the coldest month. The average daily minimum temperature in January is 25.6°F. The hottest month of the year is generally July, with an average daily maximum temperature of 87.4°F. Approximately 15 inches of snowfall and 37 inches of rainfall accumulate in the area annually. First and last frost occur approximately October 19 and April 23, respectively. During the growing season, rainfall is not uniform, and long wet and dry periods may occur.

Table 2.1

| HYDRAULIC CONDUCTIVITY SUMMARY<br>Pedricktown Support Facility<br>Salem County, New Jersey | | | |
|---|---|---|---|
| **Well/Piezometer Number** | **Feet/Minute** | **Feet/Day** | **Centimeter/Second** |
| MW2-001 | 2.03 x 10E-2 | 29.27 | 1.03 x 10E-2 |
| MW7-001 | 5.40 x 10E-3 | 7.77 | 2.74 x 10E-3 |
| MW8-001 | 2.99 x 10E-3 | 4.31 | 1.52 x 10E-3 |
| MW10-001 | 6.39 x 10E-3 | 9.20 | 3.24 x 10E-3 |
| MW11-001 | 2.13 x 10E-2 | 30.70 | 1.08 x 10E-2 |
| MW11-002 | 1.59 x 10E-2 | 22.95 | 8.09 x 10E-3 |
| MW12-001 | 1.06 x 10E-2 | 15.36 | 5.42 x 10E-3 |
| MW12-002 | 1.16 x 10E-2 | 16.73 | 5.90 x 10E-3 |
| MW13-001 | 1.12 x 10E-2 | 16.17 | 5.70 x 10E-3 |
| MW14-001 | 1.24 x 10E-2 | 17.91 | 6.32 x 10E-3 |
| MW14-002 | 1.04 x 10E-2 | 15.04 | 5.31 x 10E-3 |
| MW15-001 | 6.62 x 10E-3 | 9.53 | 3.36 x 10E-3 |
| MW16-001 | 1.61 x 10E-3 | 2.32 | 6.19 x 10E-4 |
| MW16-002 | 2.33 x 10E-3 | 3.36 | 1.18 x 10E-3 |
| MW16-003 | 1.06 x 10E-2 | 15.36 | 5.42 x 10E-3 |
| MW20-001 | 1.00 x 10E-2 | 14.41 | 5.08 x 10E-3 |
| MW21-001 | 4.44 x 10E-3 | 6.39 | 2.25 x 10E-3 |
| MW22-001 | 9.32 x 10E-4 | 1.34 | 4.73 x 10E-4 |
| MW24-001 | 5.70 x 10E-3 | 8.21 | 2.89 x 10E-3 |
| P4-001 | 1.54 x 10E-2 | 22.26 | 7.85 x 10E-3 |
| P9-001 | 1.44 x 10E-2 | 20.86 | 7.36 x 10E-3 |
| P15-001 | 2.20 x 10E-2 | 31.72 | 1.11 x 10E-2 |

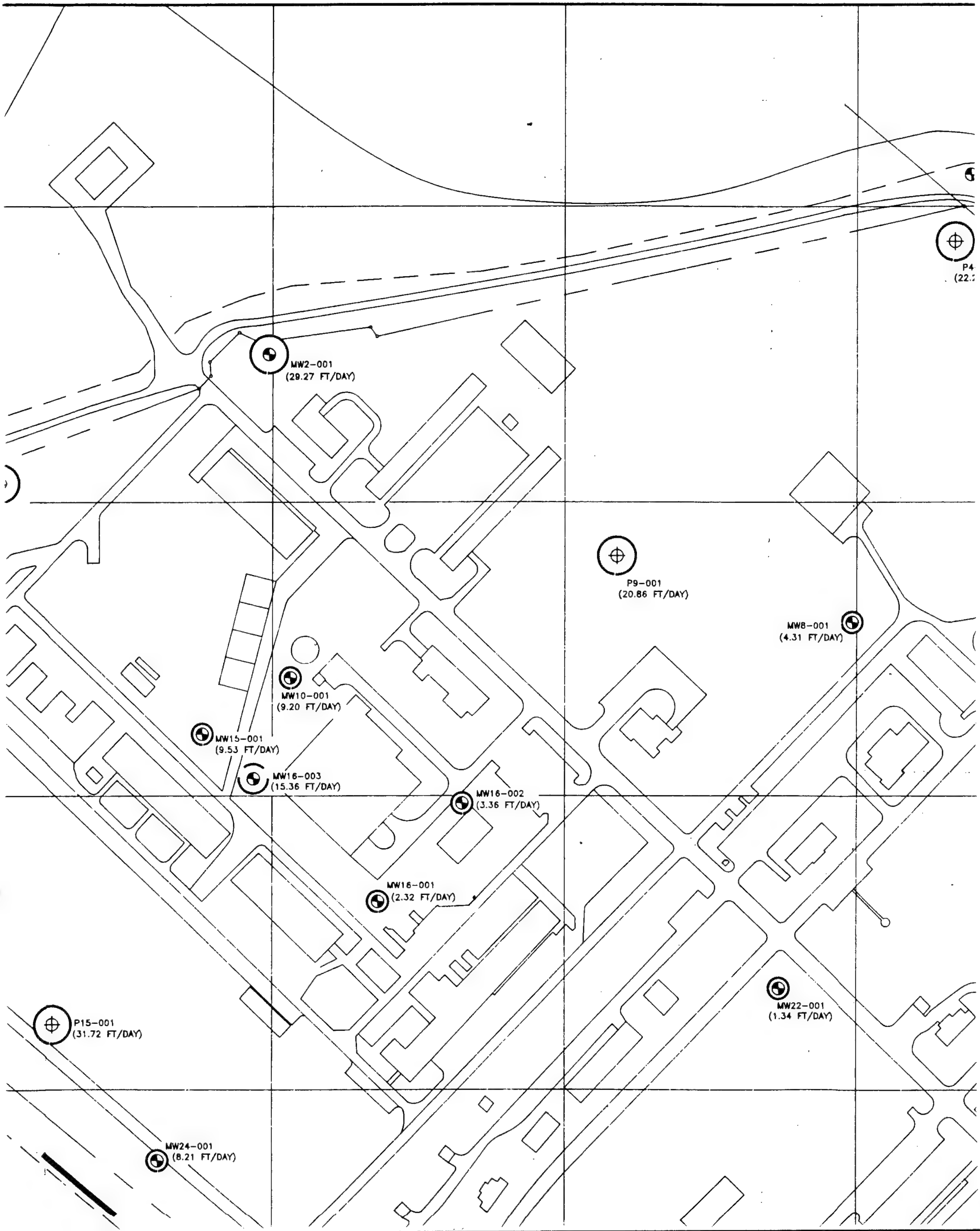
**NOTE:** **Hydraulic conductivities were derived from slug testing data and Geraghty and Miller's AQTESOLV program.**

1

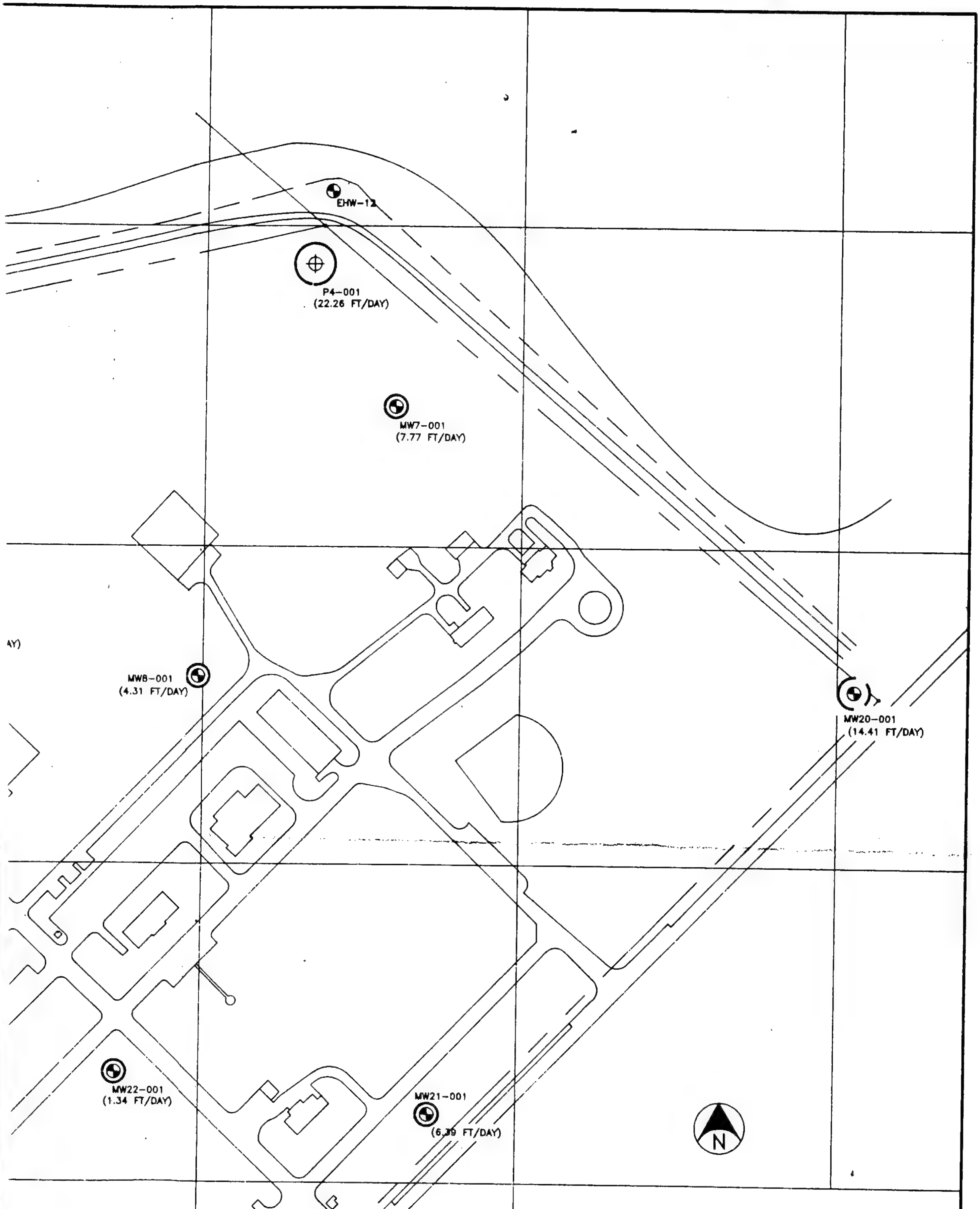


PEDRICKTOWN - SOUTH
DREDGED MATERIALS AREA
SWALE
MW11-001
(30.70 FT/DAY)
EHW-13
MW12-001
(15.36 FT/DAY)
MW12-002
(16.73 FT/DAY)
MW11-002
(22.95 FT/DAY)
WEST SWALE GAUGE
MW13-001
(16.17 FT/DAY)
SWALE
MW14-001
(17.91 FT/DAY)
MW14-002
(15.04 FT/DAY)
LAKE GAUGE
P15-001
(31.72 FT/DAY)
DGW-03
MW24-001
(8.21 FT/DAY)

2


MW2-001
(29.27 FT/DAY)
P9-001
(20.86 FT/DAY)
MW8-001
(4.31 FT/DAY)
MW10-001
(9.20 FT/DAY)
MW15-001
(9.53 FT/DAY)
MW16-003
(15.36 FT/DAY)
MW16-002
(3.36 FT/DAY)
MW16-001
(2.32 FT/DAY)
MW22-001
(1.34 FT/DAY)
P15-001
(31.72 FT/DAY)
MW24-001
(8.21 FT/DAY)

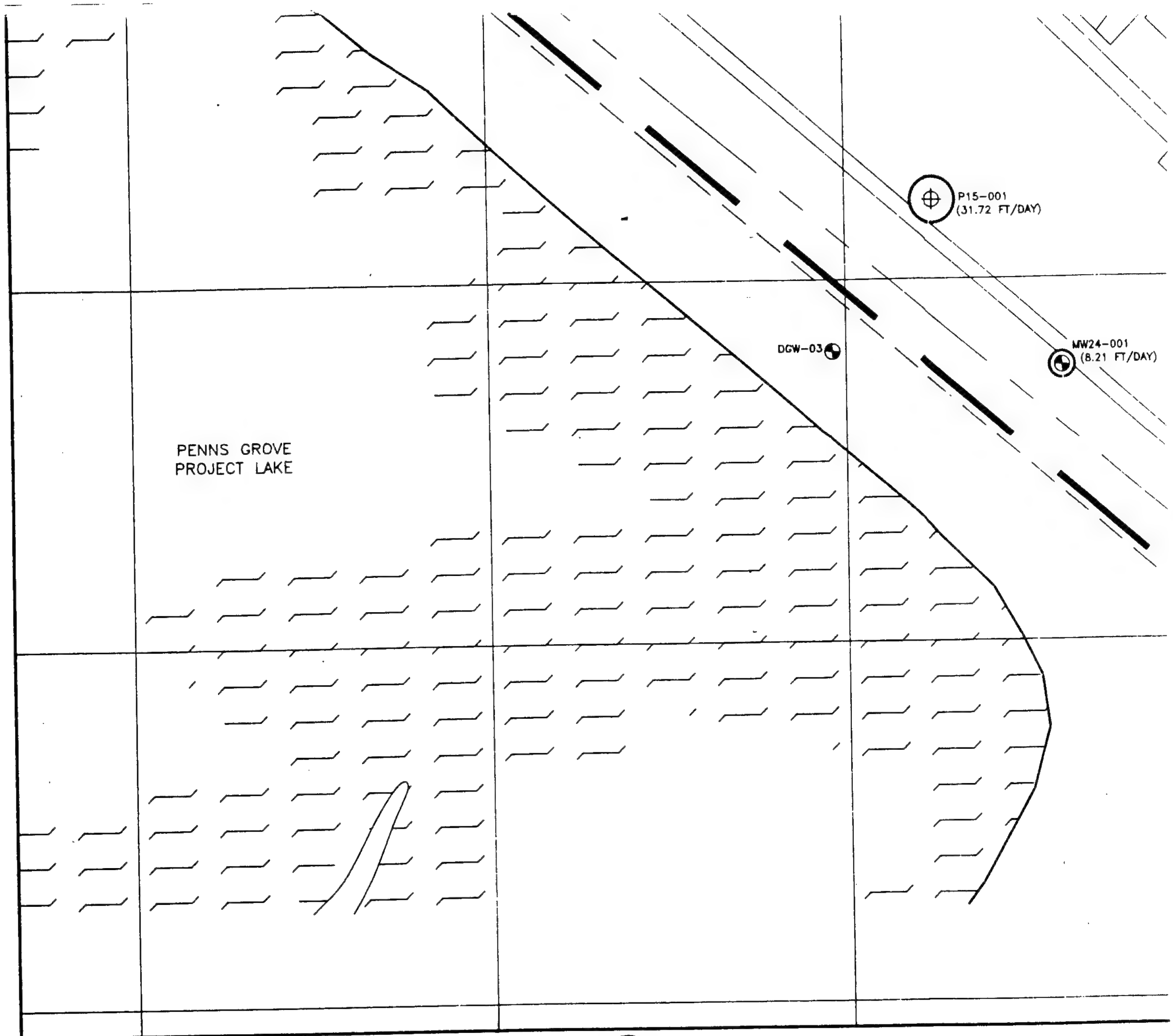
③

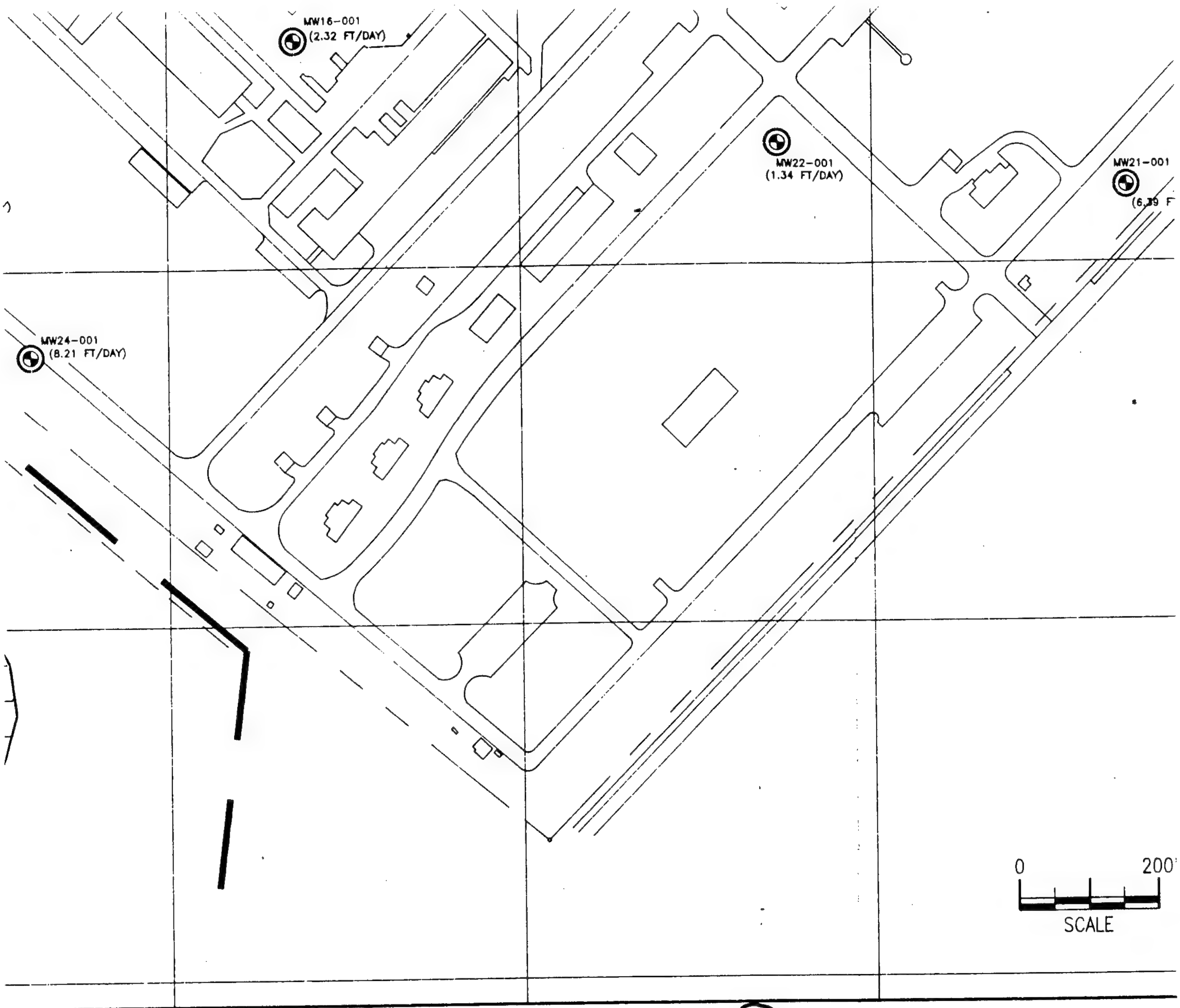



LEGEND

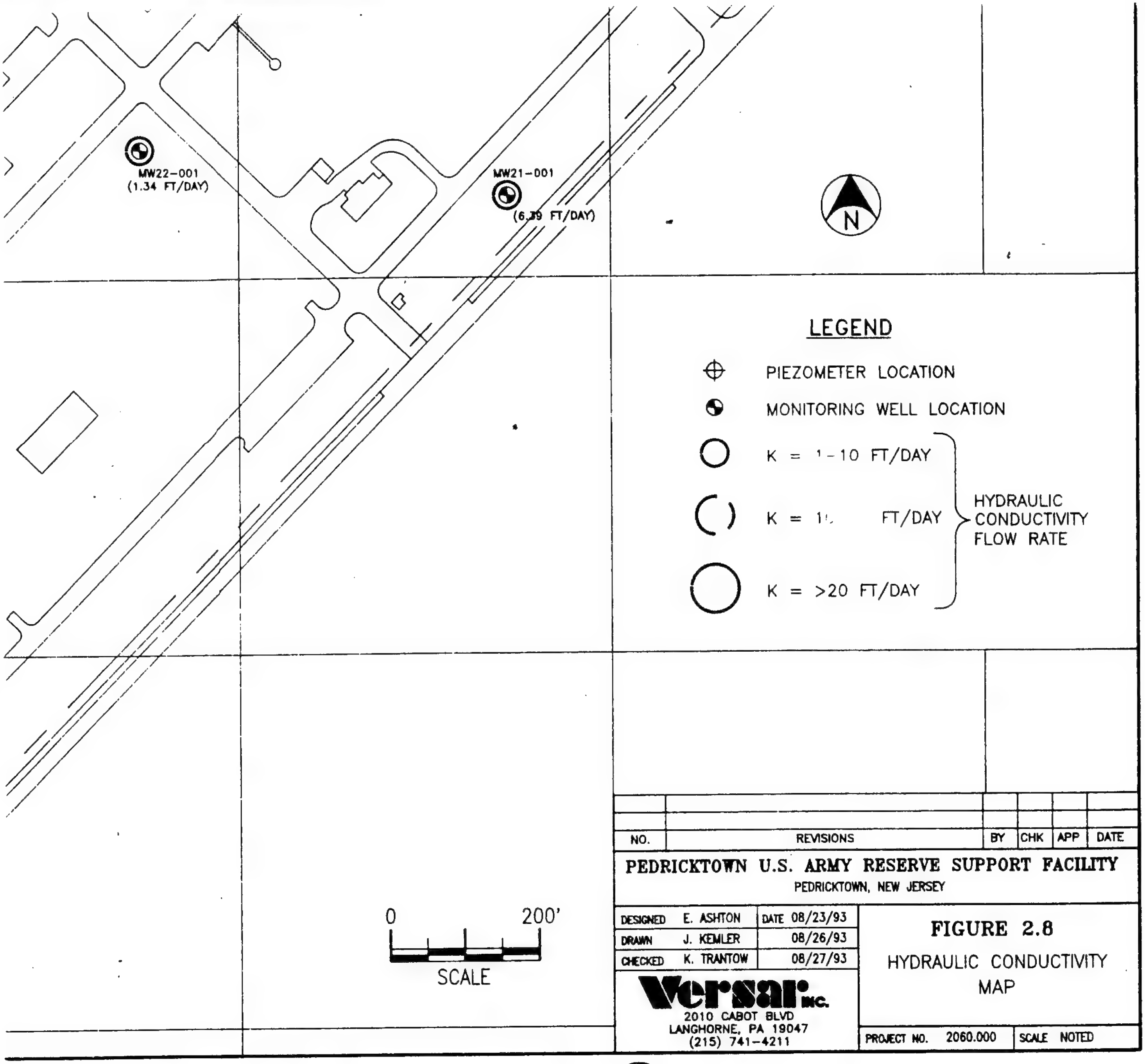
⊕ PIEZOMETER LOCATION

MONITORING WELL LOCATION

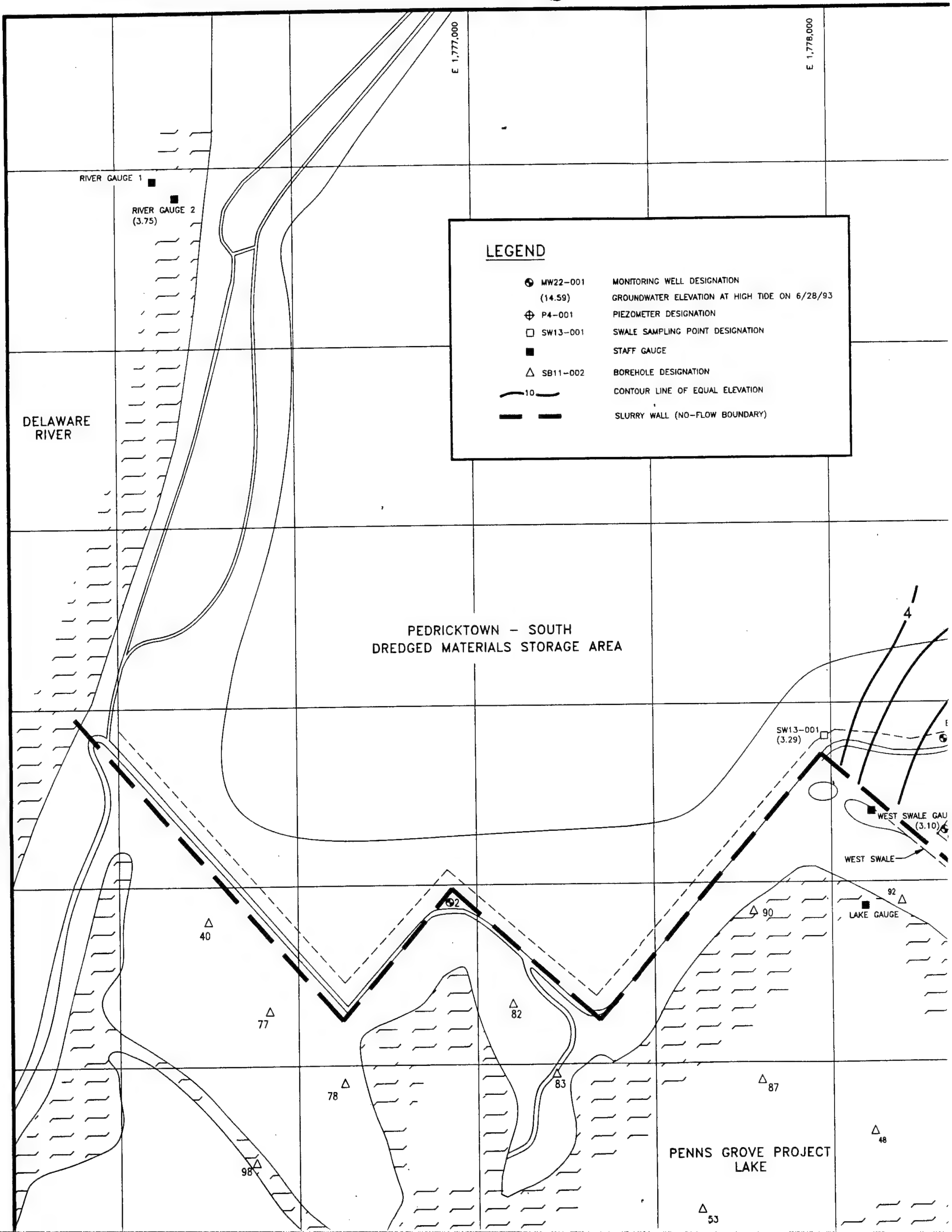

P15-001
(31.72 FT/DAY)
DGW-03
MW24-001
(8.21 FT/DAY)
PENNS GROVE
PROJECT LAKE



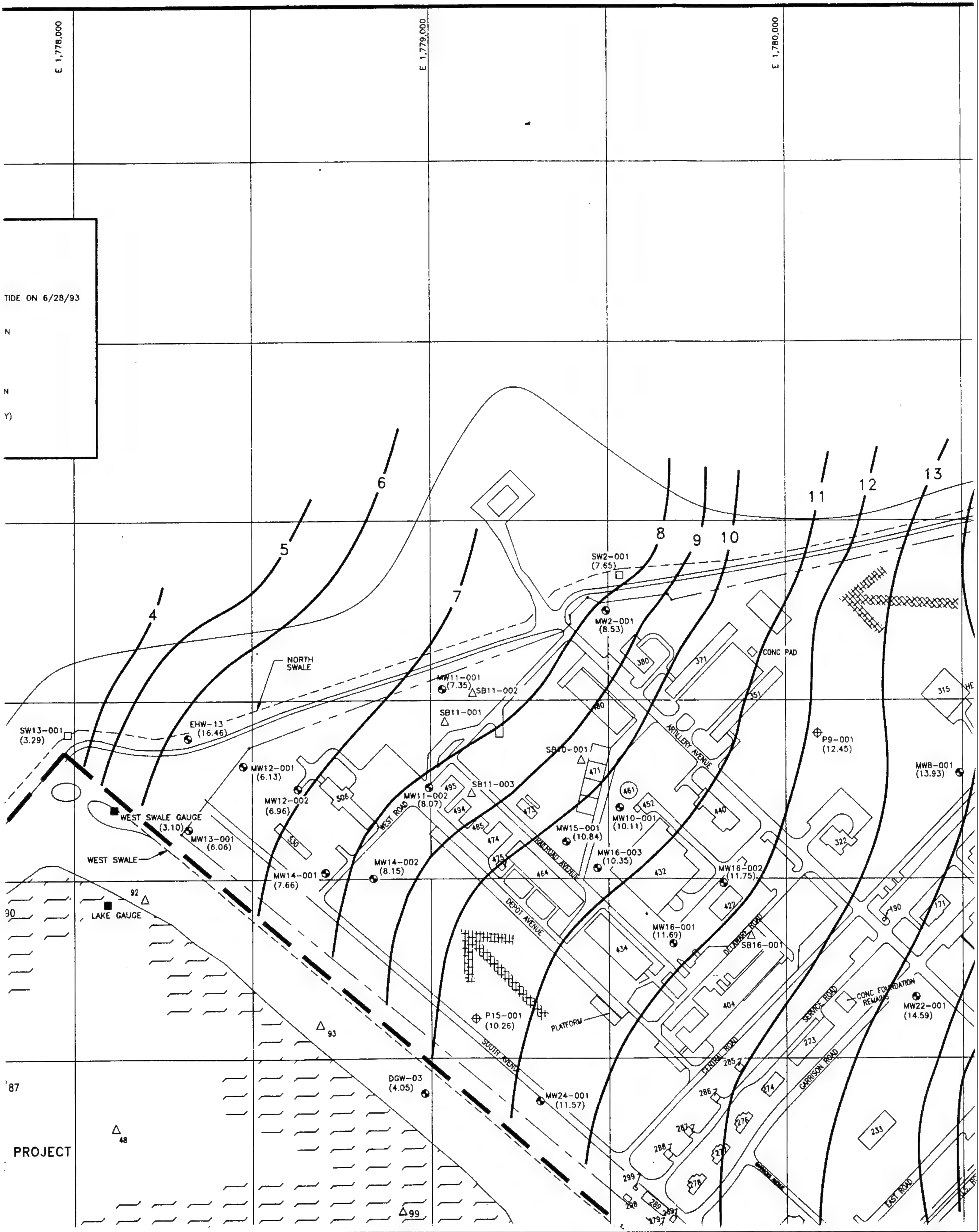
MW16-001
(2.32 FT/DAY)
MW22-001
(1.34 FT/DAY)
MW21-001
MW24-001
(8.21 FT/DAY)
0
200'
SCALE


MW22-001
(1.34 FT/DAY)
MW21-001
(6.39 FT/DAY)
N
LEGEND
PIEZOMETER LOCATION
MONITORING WELL LOCATION
K = 1-10 FT/DAY
K = 1 FT/DAY
K = >20 FT/DAY
HYDRAULIC CONDUCTIVITY FLOW RATE
0
200'
SCALE
NO.
REVISIONS
BY
CHK
APP
DATE
PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY
DESIGNED E. ASHTON DATE 08/23/93
DRAWN J. KEMLER 08/26/93
CHECKED K. TRANTOW 08/27/93
Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211
FIGURE 2.8
HYDRAULIC CONDUCTIVITY MAP
PROJECT NO. 2060.000
SCALE NOTED

1

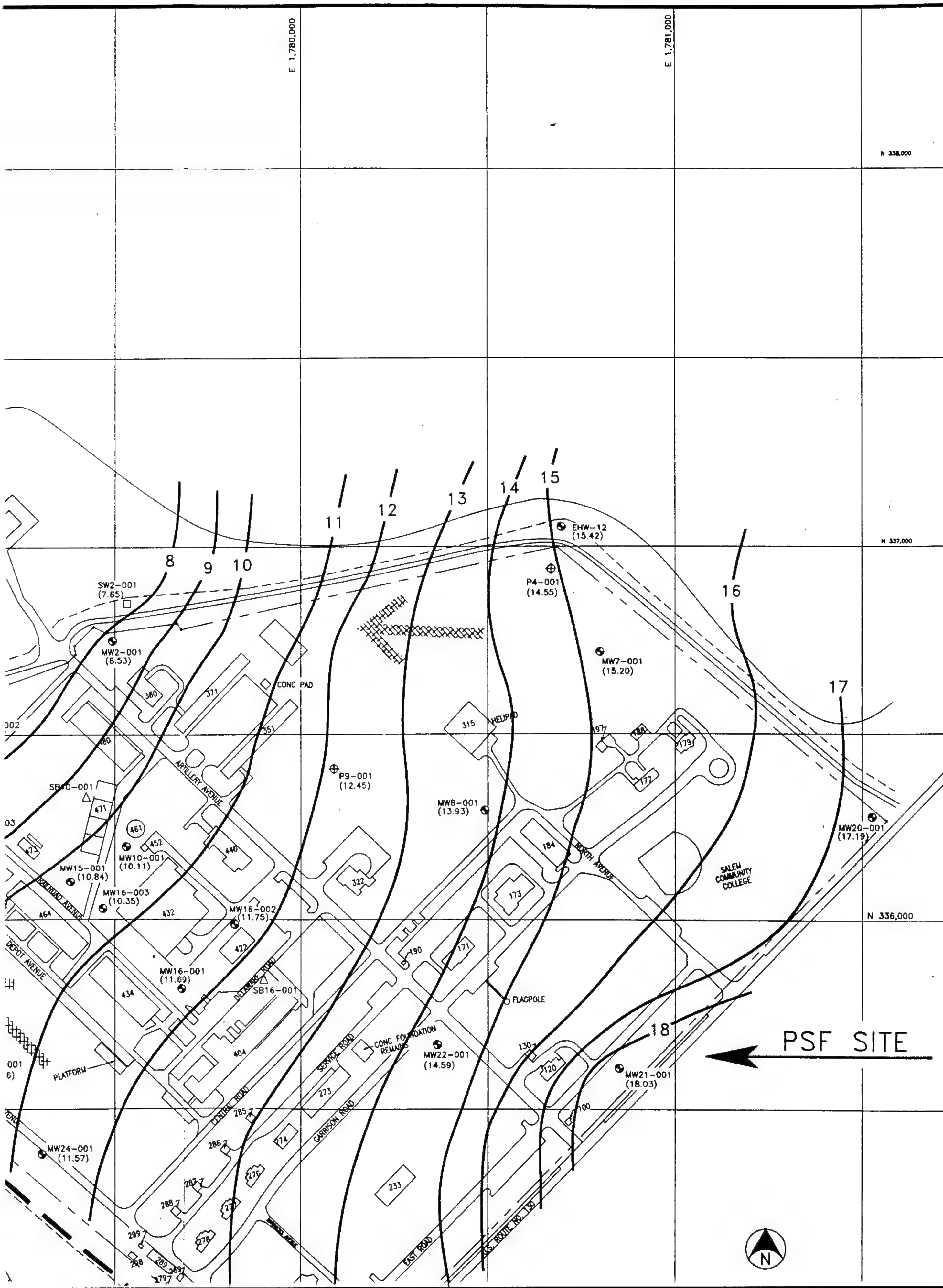

E 1,777,000
E 1,778,000
RIVER GAUGE 1
RIVER GAUGE 2
(3.75)
LEGEND
MW22-001 MONITORING WELL DESIGNATION
(14.59) GROUNDWATER ELEVATION AT HIGH TIDE ON 6/28/93
P4-001 PIEZOMETER DESIGNATION
SW13-001 SWALE SAMPLING POINT DESIGNATION
STAFF GAUGE
SB11-002 BOREHOLE DESIGNATION
10 CONTOUR LINE OF EQUAL ELEVATION
SLURRY WALL (NO-FLOW BOUNDARY)
DELAWARE RIVER
PEDRICKTOWN - SOUTH DREDGED MATERIALS STORAGE AREA
4
SW13-001
(3.29)
WEST SWALE GAU
(3.10)
WEST SWALE
92
LAKE GAUGE
40
77
82
90
78
83
87
48
98
53
PENNS GROVE PROJECT LAKE

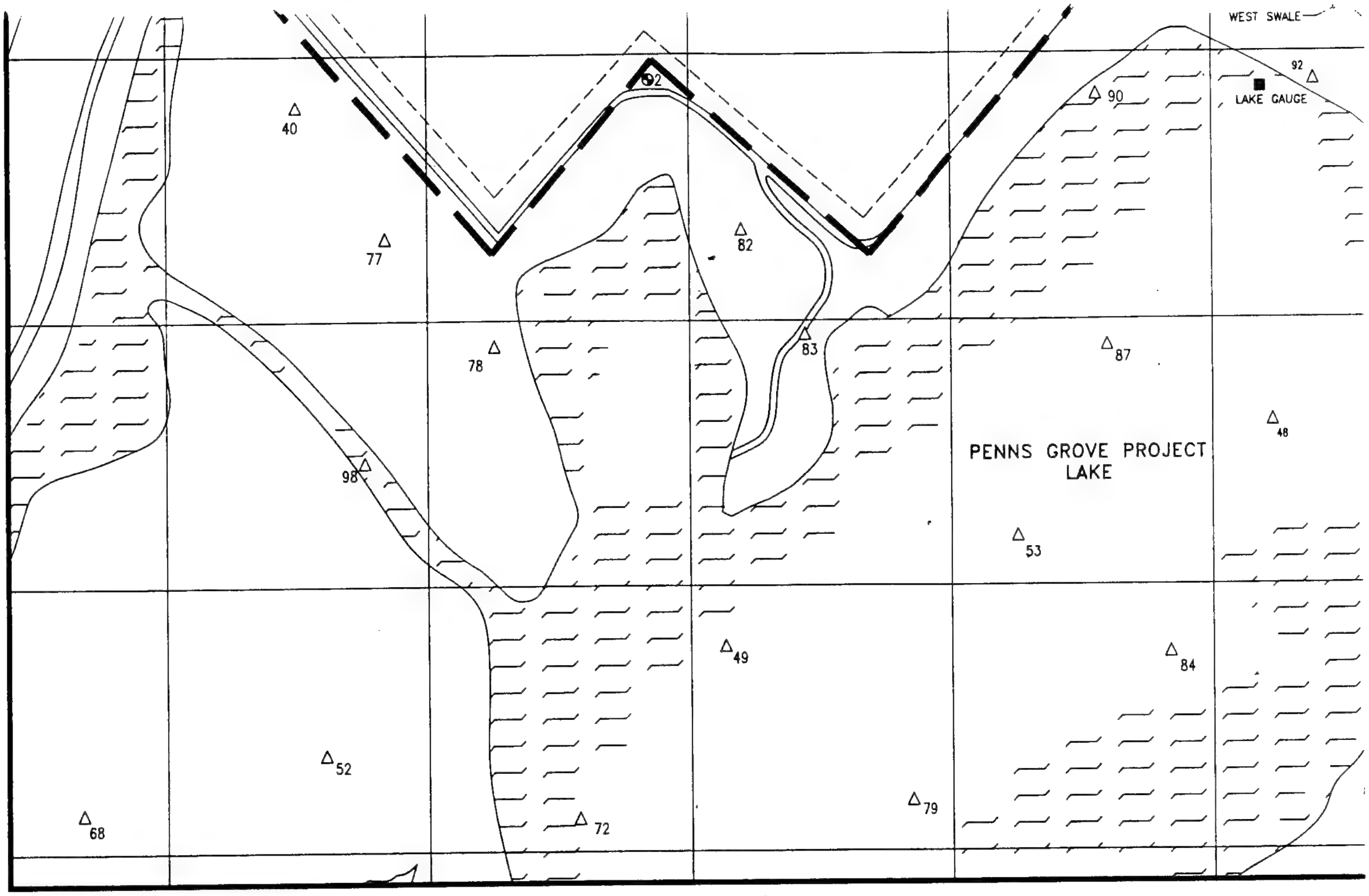
②

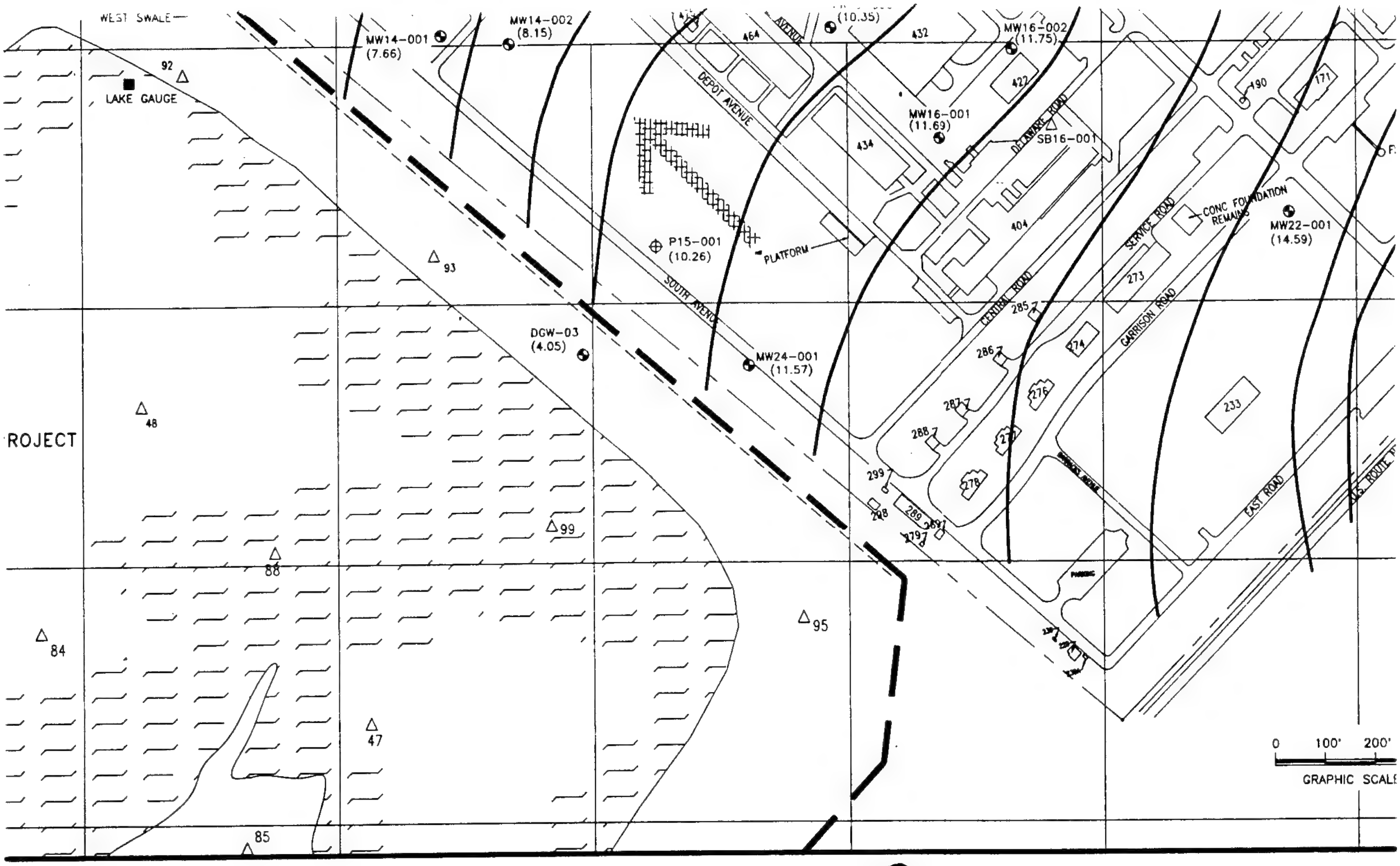


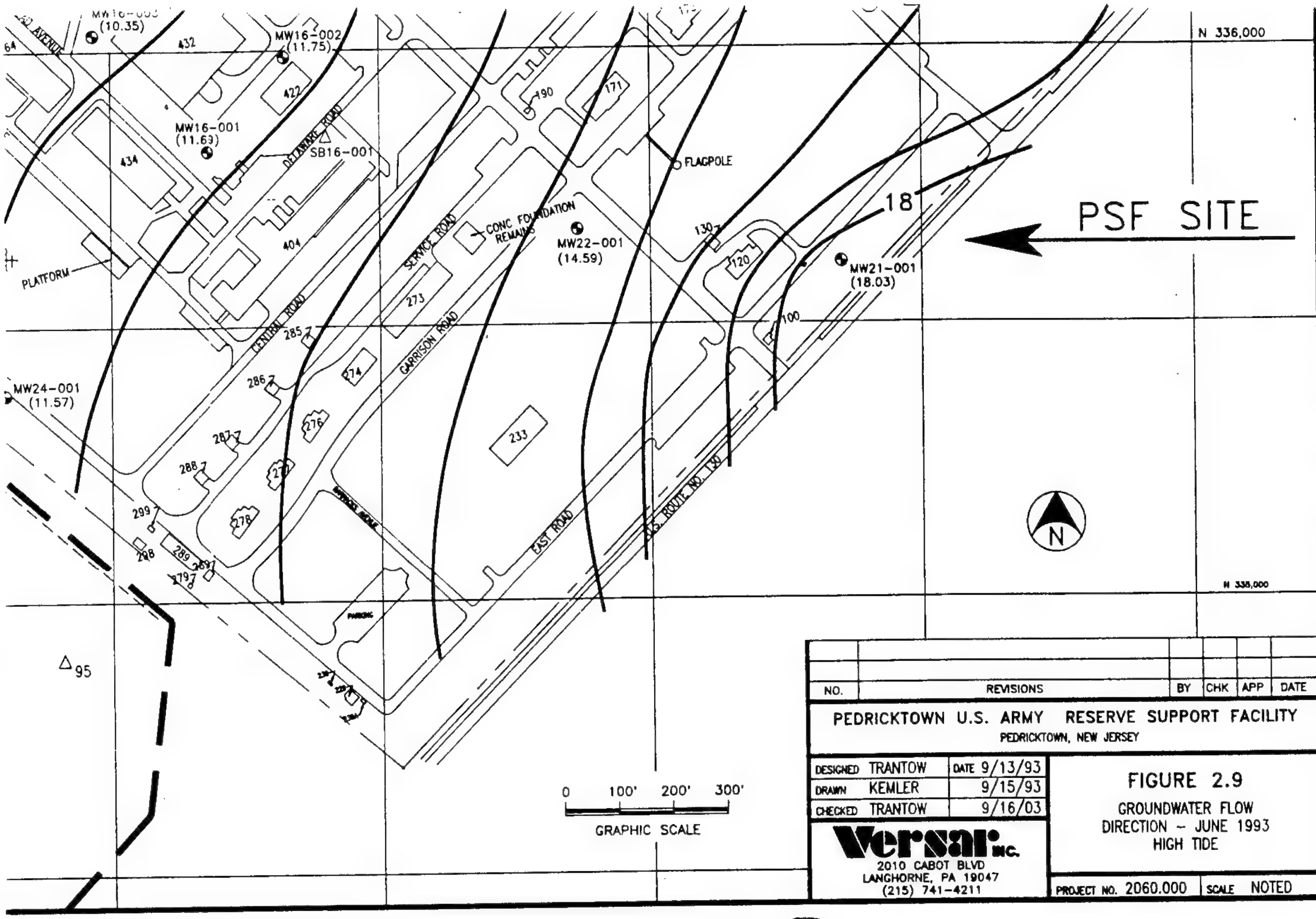
E 1,778,000
E 1,779,000
E 1,780,000
TIDE ON 6/28/93
N
N
Y)
4
5
6
7
8
9
10
11
12
13
NORTH SWALE
SW2-001 (7.65)
MW2-001 (8.53)
CONC PAD
SW13-001 (3.29)
EHW-13 (16.46)
MW11-001 (7.35)
SB11-002
SB11-001
SB11-003
SB10-001
P9-001 (12.45)
MW8-001 (13.93)
MW12-001 (6.13)
MW12-002 (6.96)
MW11-002 (8.07)
WEST SWALE GAUGE (3.10)
MW13-001 (6.06)
WEST SWALE
MW10-001 (10.11)
MW15-001 (10.84)
MW16-003 (10.35)
MW16-002 (11.75)
MW14-001 (7.66)
MW14-002 (8.15)
LAKE GAUGE
MW16-001 (11.69)
SB16-001
P15-001 (10.26)
PLATFORM
CONC FOUNDATION REMAINS
MW22-001 (14.59)
DGW-03 (4.05)
MW24-001 (11.57)
WEST ROAD
ARTILLERY AVENUE
RAILROAD AVENUE
DEPOT AVENUE
DELAWARE ROAD
SOUTH AVENUE
CENTRAL ROAD
SERVICE ROAD
GARRISON ROAD
EAST ROAD
92
93
99
48
87
90
PROJECT

3


E 1,780,000
E 1,781,000
N 338,000
N 337,000
N 336,000
8
9
10
11
12
13
14
15
16
17
18
EHW-12
(15.42)
P4-001
(14.55)
SW2-001
(7.65)
MW2-001
(8.53)
MW7-001
(15.20)
CONC PAD
380
371
351
480
315
HELIPAD
197
188
179
177
P9-001
(12.45)
SB10-001
471
461
452
MW8-001
(13.93)
ARTILLERY AVENUE
MW10-001
(10.11)
MW15-001
(10.84)
MW16-003
(10.35)
440
184
NORTH AVENUE
MW20-001
(17.19)
SALEM COMMUNITY COLLEGE
322
173
RAILROAD AVENUE
464
432
MW16-002
(11.75)
DEPOT AVENUE
422
190
171
MW16-001
(11.69)
DELAWARE ROAD
SB16-001
434
FLAGPOLE
PSF SITE
PLATFORM
404
CONC FOUNDATION REMAINS
SERVICE ROAD
MW22-001
(14.59)
130
120
MW21-001
(18.03)
273
CENTRAL ROAD
GARRISON ROAD
100
285
MW24-001
(11.57)
286
274
276
233
287
288
277
299
278
EAST ROAD
U.S. ROUTE NO. 130
298
289
297
N


WEST SWALE
92
LAKE GAUGE
90
40
77
82
78
83
87
48
PENNS GROVE PROJECT
LAKE
98
53
49
84
52
68
72
79


WEST SWALE
92
LAKE GAUGE
MW14-001
(7.66)
MW14-002
(8.15)
464
AVENUE
(10.35)
432
MW16-002
(11.75)
422
190
171
DEPOT AVENUE
MW16-001
(11.69)
434
DELAWARE ROAD
SB16-001
P15-001
(10.26)
PLATFORM
404
SERVICE ROAD
CONC FOUNDATION
REMAINS
MW22-001
(14.59)
93
273
SOUTH AVENUE
CENTRAL ROAD
285
GARRISON ROAD
DGW-03
(4.05)
MW24-001
(11.57)
286
274
276
233
48
ROJECT
287
288
299
278
298
289
269
279
EAST ROAD
99
88
84
95
47
85
0
100'
200'
GRAPHIC SCAL




| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|

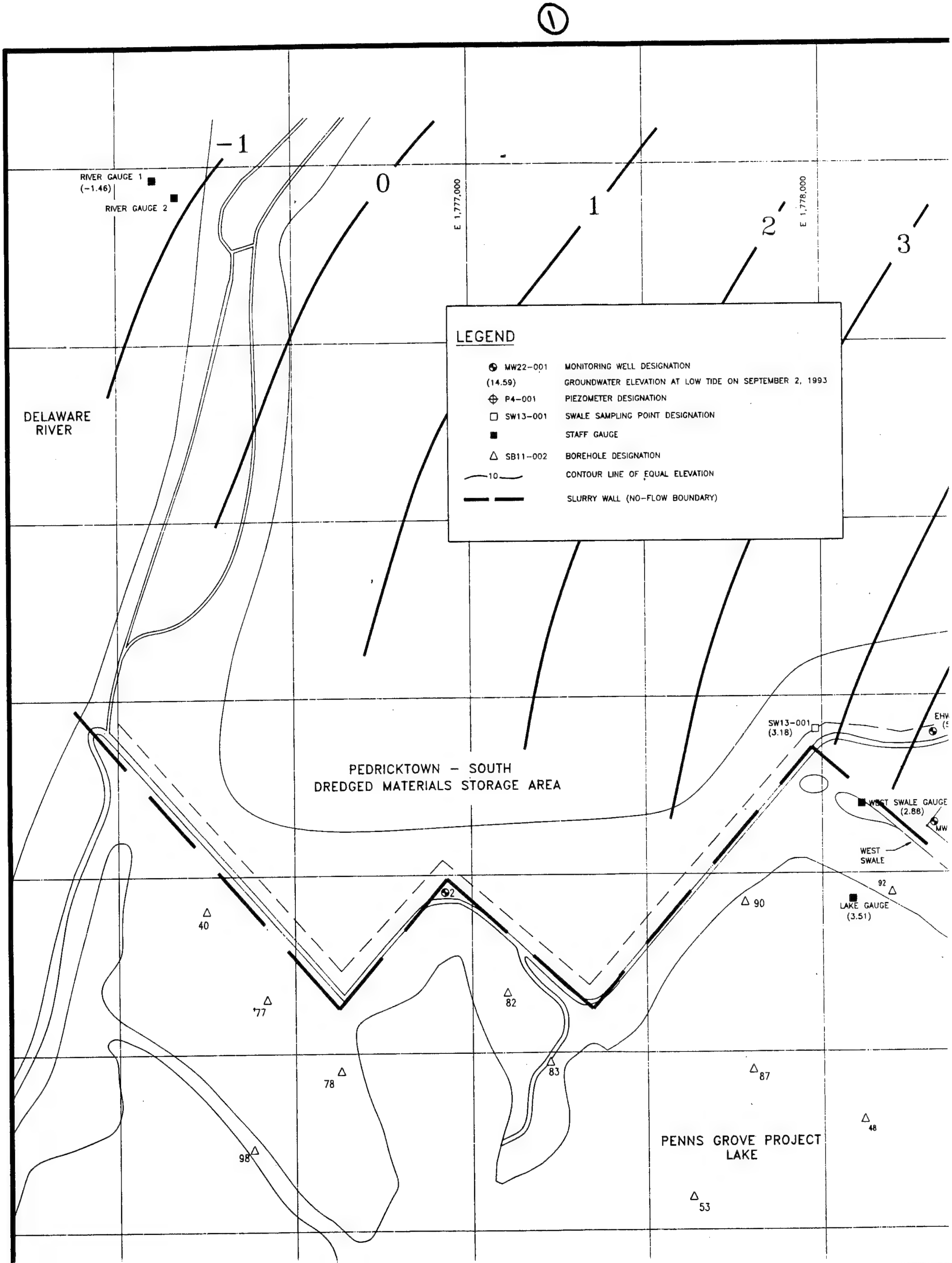
PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY

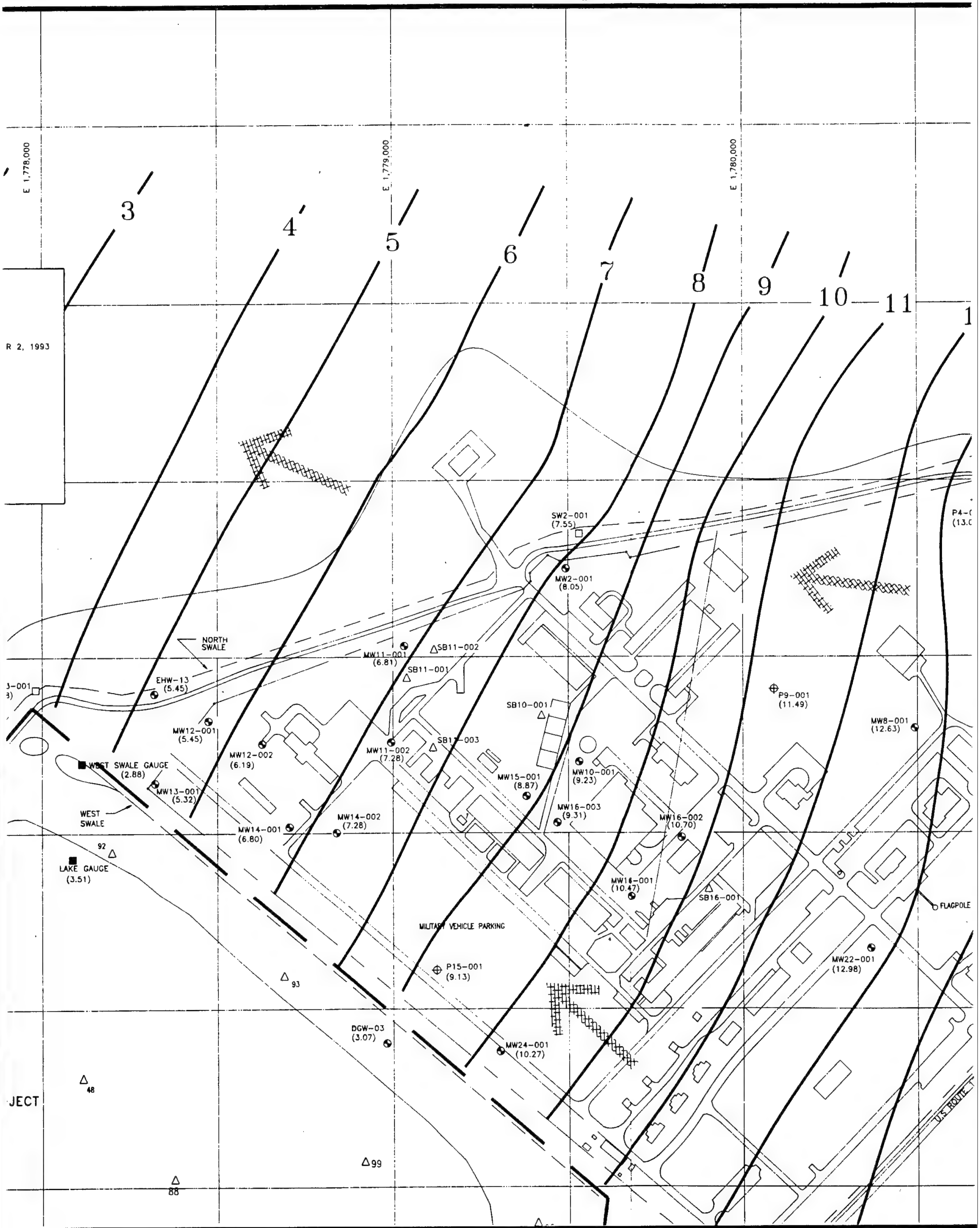
| | | | |
|---|---|---|---|
| DESIGNED | TRANTOW | DATE | 9/13/93 |
| DRAWN | KEMLER | | 9/15/93 |
| CHECKED | TRANTOW | | 9/16/03 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

FIGURE 2.9
GROUNDWATER FLOW DIRECTION – JUNE 1993 HIGH TIDE

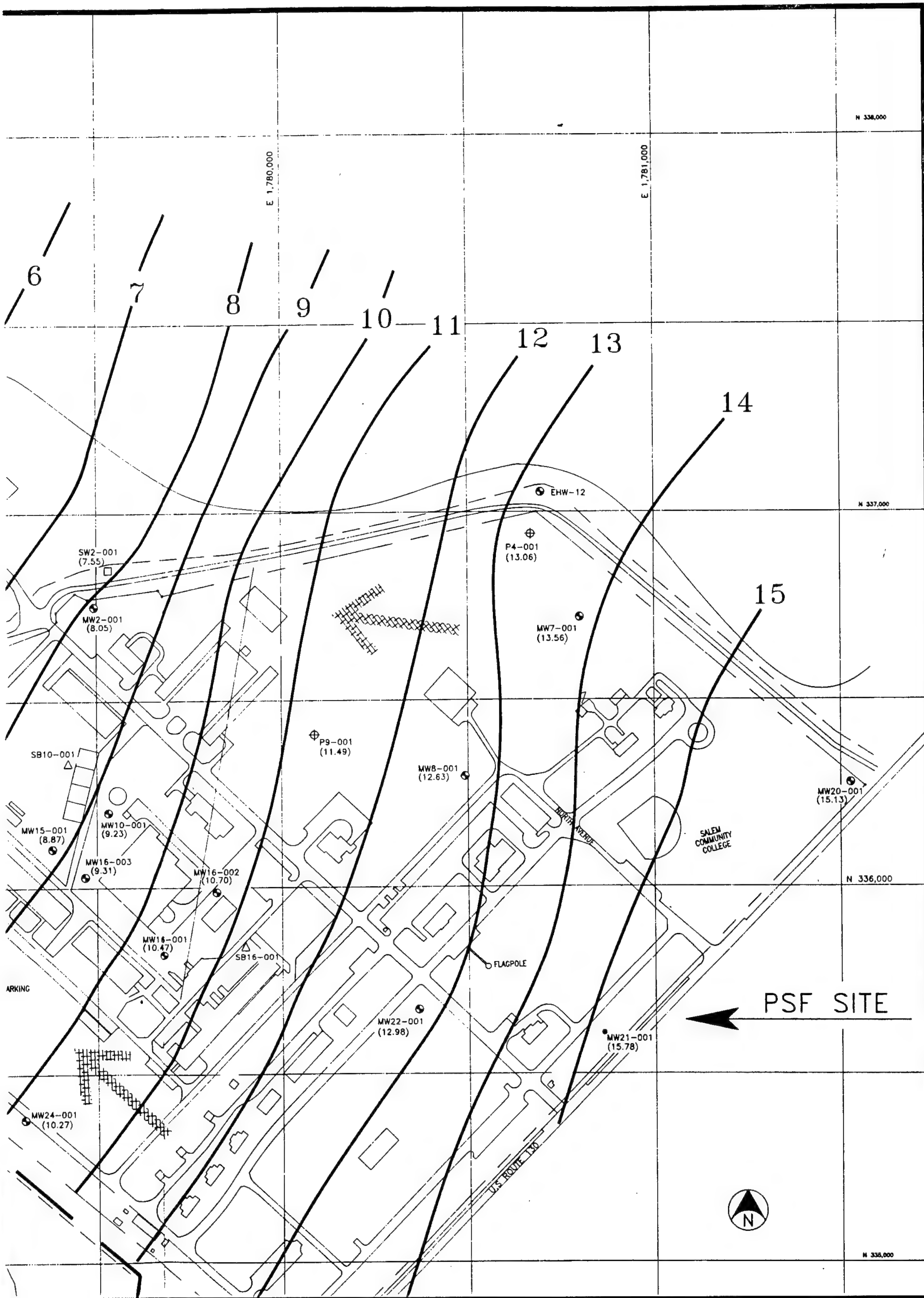
PROJECT NO. 2060.000 SCALE NOTED

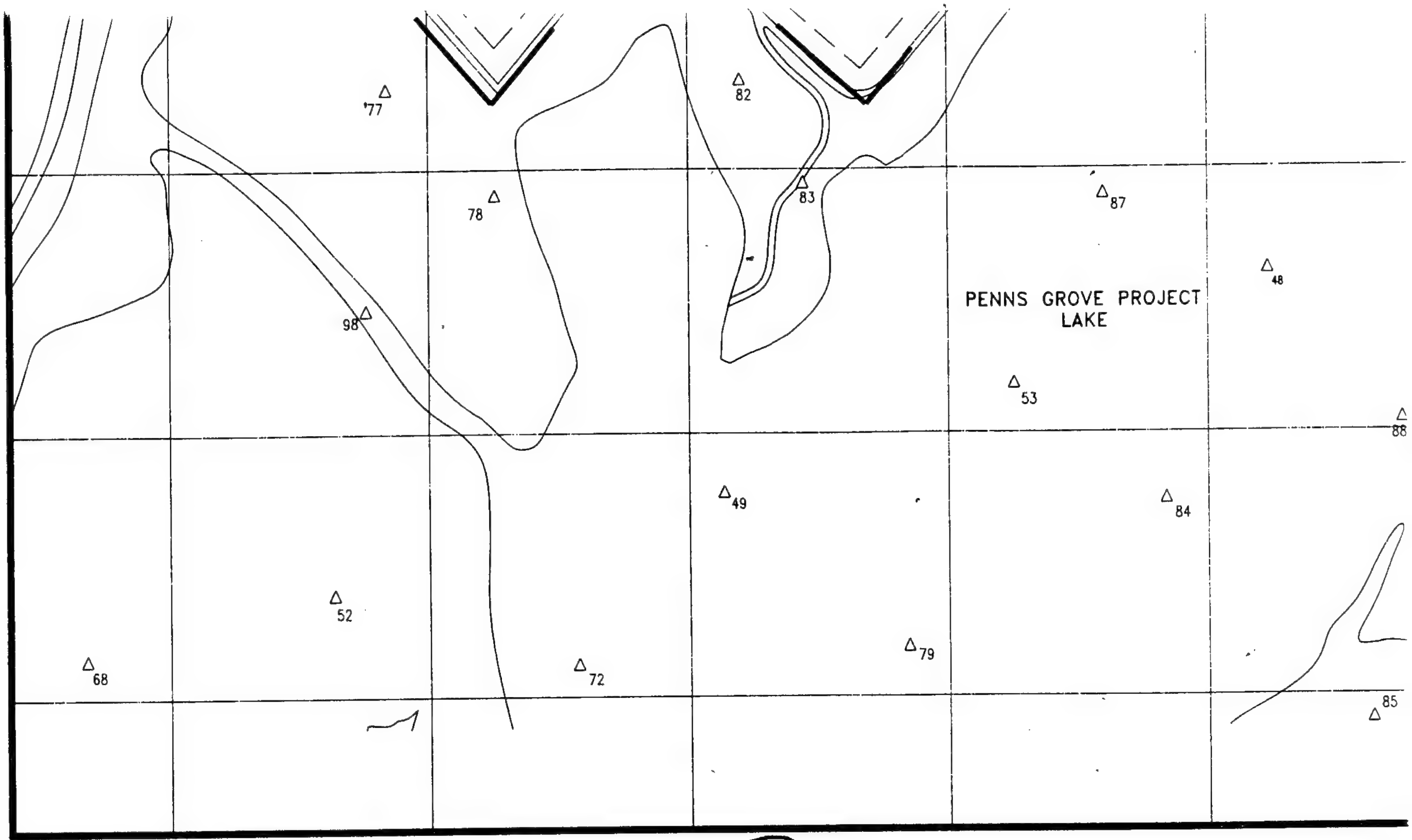

①
-1
0
1
2
3
RIVER GAUGE 1
(-1.46)
RIVER GAUGE 2
E 1,777,000
E 1,778,000
LEGEND
MW22-001 MONITORING WELL DESIGNATION
(14.59) GROUNDWATER ELEVATION AT LOW TIDE ON SEPTEMBER 2, 1993
P4-001 PIEZOMETER DESIGNATION
SW13-001 SWALE SAMPLING POINT DESIGNATION
STAFF GAUGE
SB11-002 BOREHOLE DESIGNATION
10 CONTOUR LINE OF EQUAL ELEVATION
SLURRY WALL (NO-FLOW BOUNDARY)
DELAWARE RIVER
PEDRICKTOWN - SOUTH
DREDGED MATERIALS STORAGE AREA
SW13-001
(3.18)
WEST SWALE GAUGE
(2.88)
WEST SWALE
LAKE GAUGE
(3.51)
40
77
78
98
82
83
87
90
92
48
53
PENNS GROVE PROJECT LAKE



2
E 1,778,000
E 1,779,000
E 1,780,000
R 2, 1993
3
4
5
6
7
8
9
10
11
SW2-001 (7.55)
MW2-001 (8.05)
P4-0 (13.0
NORTH SWALE
EHW-13 (5.45)
MW11-001 (6.81)
SB11-002
SB11-001
SB10-001
P9-001 (11.49)
MW8-001 (12.63)
MW12-001 (5.45)
MW12-002 (6.19)
MW11-002 (7.28)
SB11-003
WEST SWALE GAUGE (2.88)
MW13-001 (5.32)
MW15-001 (8.87)
MW10-001 (9.23)
WEST SWALE
MW14-001 (6.80)
MW14-002 (7.28)
MW16-003 (9.31)
MW16-002 (10.70)
92
LAKE GAUGE (3.51)
MW16-001 (10.47)
SB16-001
FLAGPOLE
MILITARY VEHICLE PARKING
P15-001 (9.13)
MW22-001 (12.98)
93
DGW-03 (3.07)
MW24-001 (10.27)
48
JECT
U.S. ROUTE
99
88

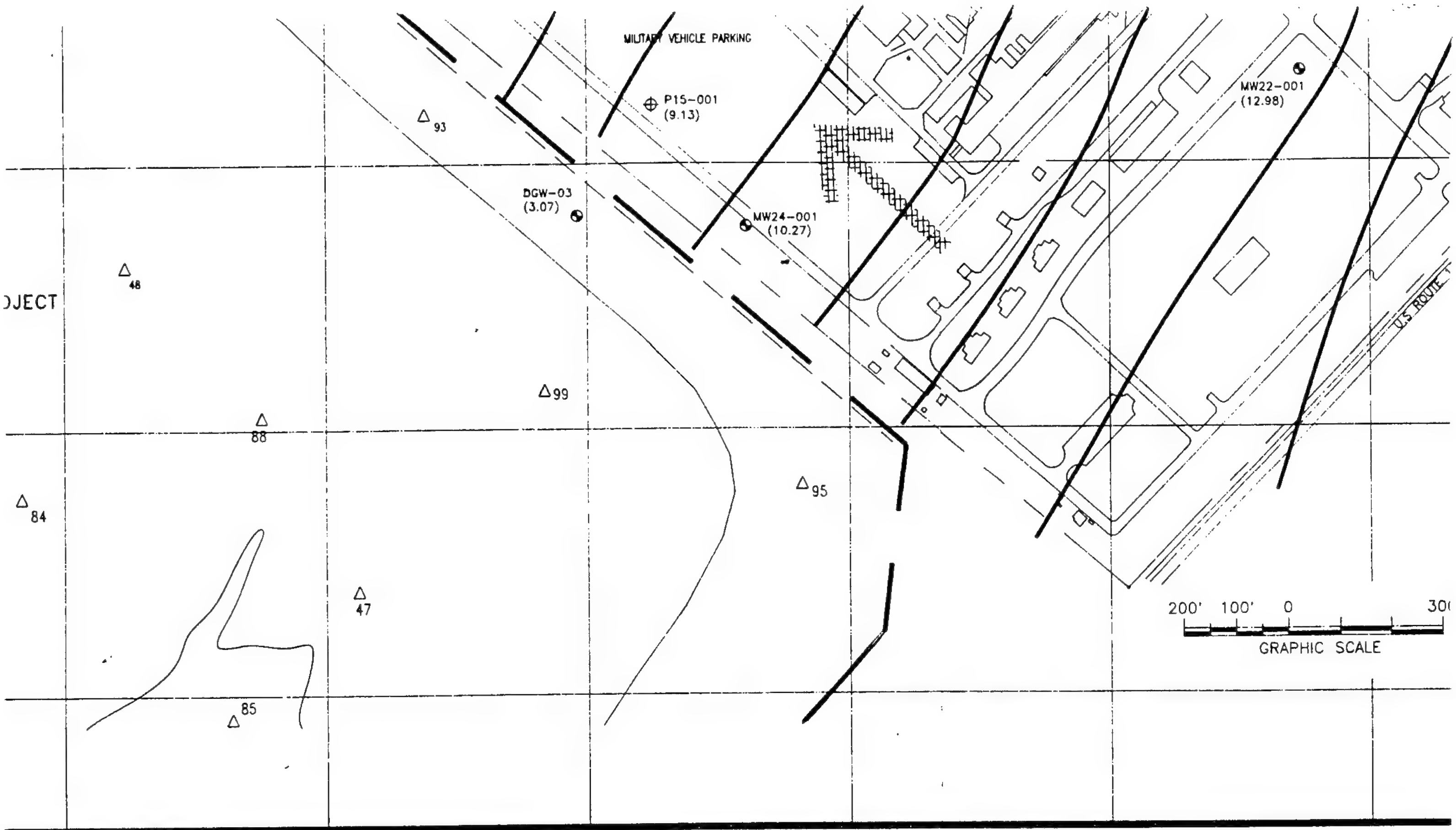
(3)

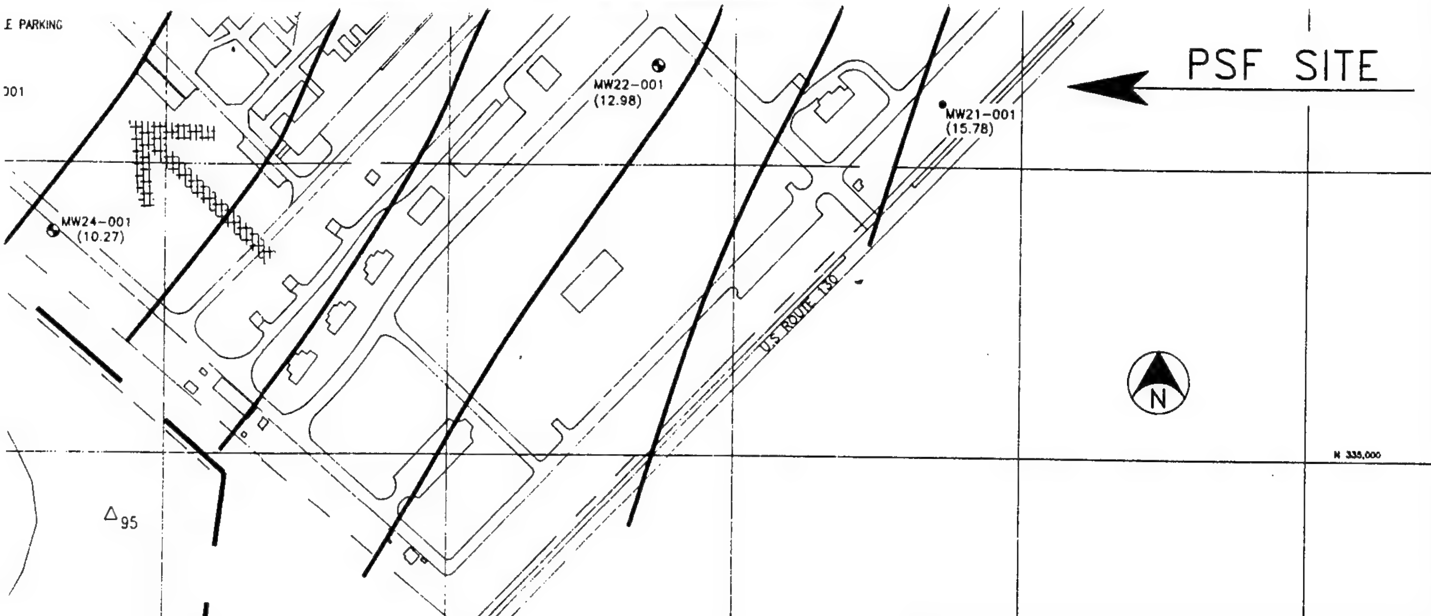

N 338,000
E 1,780,000
E 1,781,000
6
7
8
9
10
11
12
13
14
15
EHW-12
N 337,000
SW2-001
(7.55)
P4-001
(13.06)
MW2-001
(8.05)
MW7-001
(13.56)
P9-001
(11.49)
SB10-001
MW8-001
(12.63)
MW20-001
(15.13)
MW15-001
(8.87)
MW10-001
(9.23)
NORTH AVENUE
SALEM COMMUNITY COLLEGE
MW16-003
(9.31)
MW16-002
(10.70)
N 336,000
MW16-001
(10.47)
SB16-001
FLAGPOLE
ARKING
PSF SITE
MW22-001
(12.98)
MW21-001
(15.78)
MW24-001
(10.27)
U.S. ROUTE 130
N
N 335,000



77
82
78
83
87
48
PENNS GROVE PROJECT
LAKE
98
53
88
49
84
52
79
68
72
85


4


MILITARY VEHICLE PARKING
P15-001
(9.13)
MW22-001
(12.98)
93
DGW-03
(3.07)
MW24-001
(10.27)
48
)JECT
99
88
84
95
47
85
U.S. ROUTE
200' 100' 0 30
GRAPHIC SCALE




| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|

PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | TRANTOW | DATE 9/13/93 |
| DRAWN | KEMLER | 9/15/93 |
| CHECKED | TRANTOW | 9/16/03 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

FIGURE 2.10
GROUNDWATER FLOW DIRECTION – SEPTEMBER 1993 LOW TIDE

PROJECT NO. 2060.000 SCALE NOTED

Table 2.2
WELL/PIEZOMETER FLUID LEVEL MEASUREMENTS
Pedricktown Support Facility
Salem County, New Jersey

| Well/Piezometer Number | Date Measured | Depth to Water (ft) | Total Well Depth Below Grade (ft) | Elevation* of PVC Casing (ft) | Water Table Elevation* (ft) |
|---|---|---|---|---|---|
| MW2-001 | 6/28/93 | H 4.22 | 12.0 | 12.75 | 8.53 |
| | | L 4.23 | | | 8.52 |
| | 9/2/93 | H 4.67 | | | 8.08 |
| | | L 4.70 | | | 8.05 |
| MW7-001 | 6/28/93 | H 4.12 | 11.5 | 19.32 | 15.20 |
| | | L 4.21 | | | 15.11 |
| | 9/2/93 | H 5.75 | | | 13.57 |
| | | L 5.76 | | | 13.56 |
| MW8-001 | 6/28/93 | H 5.78 | 12.5 | 19.71 | 13.93 |
| | | L 5.79 | | | 13.92 |
| | 9/2/93 | H 7.08 | | | 12.63 |
| | | L 7.08 | | | 12.63 |
| MW10-001 | 6/28/93 | H 4.94 | 12.0 | 15.05 | 10.11 |
| | | L 4.91 | | | 10.14 |
| | 9/2/93 | H 5.79 | | | 9.26 |
| | | L 5.82 | | | 9.23 |
| MW11-001 | 6/28/93 | H 4.63 | 12.0 | 11.98 | 7.35 |
| | | L 4.64 | | | 7.34 |
| | 9/2/93 | H 5.14 | | | 6.84 |
| | | L 5.17 | | | 6.81 |
| MW11-002 | 6/28/93 | H 5.35 | 12.5 | 13.42 | 8.07 |
| | | L 5.35 | | | 8.07 |
| | 9/2/93 | H 6.11 | | | 7.31 |
| | | L 6.14 | | | 7.28 |
| MW12-001 | 6/28/93 | H 4.85 | 11.5 | 10.98 | 6.13 |
| | | L 4.85 | | | 6.13 |
| | 9/2/93 | H 5.50 | | | 5.48 |
| | | L 5.53 | | | 5.45 |
| MW12-002 | 6/28/93 | H 5.41 | 11.5 | 12.37 | 6.96 |
| | | L 5.42 | | | 6.95 |
| | 9/2/93 | H 6.15 | | | 6.22 |
| | | L 6.18 | | | 6.19 |
| MW13-001 | 6/28/93 | H 5.55 | 13.0 | 11.61 | 6.06 |
| | | L 5.50 | | | 6.11 |
| | 9/2/93 | H 6.25 | | | 5.36 |
| | | L 6.29 | | | 5.32 |
| MW14-001 | 6/28/93 | H 3.59 | 11.5 | 11.25 | 7.66 |
| | | L 3.60 | | | 7.65 |
| | 9/2/93 | H 4.34 | | | 6.91 |
| | | L 4.45 | | | 6.80 |
| MW14-002 | 6/28/93 | H 4.03 | 11.5 | 12.18 | 8.15 |
| | | L 4.04 | | | 8.14 |
| | 9/2/93 | H 4.84 | | | 7.34 |
| | | L 4.90 | | | 7.28 |
| MW15-001 | 6/28/93 | H 4.45 | 12.5 | 15.29 | 10.84 |
| | | L 5.45 | | | 9.84 |
| | 9/2/93 | H 6.40 | | | 8.89 |
| | | L 6.42 | | | 8.87 |
| MW16-001 | 6/28/93 | H 6.90 | 12.0 | 18.59 | 11.69 |
| | | L 6.90 | | | 11.69 |
| | 9/2/93 | H 8.10 | | | 10.49 |
| | | L 8.12 | | | 10.47 |

Table 2.2 (continued)
WELL/PIEZOMETER FLUID LEVEL MEASUREMENTS
Pedricktown Support Facility
Salem County, New Jersey

| Well/Piezometer Number | Date Measured | Depth to Water (ft) | Total Well Depth Below Grade (ft) | Elevation* of PVC Casing (ft) | Water Table Elevation* (ft) |
|---|---|---|---|---|---|
| MW16-002 | 6/28/93 | H 4.36 | 12.0 | 16.11 | 11.75 |
| | | L 4.36 | | | 11.75 |
| | 9/2/93 | H 5.37 | | | 10.74 |
| | | L 5.41 | | | 10.70 |
| MW16-003 | 6/28/93 | H 6.65 | 12.5 | 17.0 | 10.35 |
| | | L 6.65 | | | 10.35 |
| | 9/2/93 | H 7.69 | | | 9.31 |
| | | L 7.69 | | | 9.31 |
| MW20-001 | 6/28/93 | H 5.97 | 13.6 | 23.16 | 17.19 |
| | | L 6.09 | | | 17.07 |
| | 9/2/93 | H 7.88 | | | 15.28 |
| | | L 7.85 | | | 15.31 |
| MW21-001 | 6/28/93 | H 7.625 | 15.0 | 25.65 | 18.03 |
| | | L 7.63 | | | 18.02 |
| | 9/2/93 | H 9.86 | | | 15.79 |
| | | L 9.87 | | | 15.78 |
| MW22-001 | 6/28/93 | H 6.49 | 12.5 | 21.08 | 14.59 |
| | | L 6.49 | | | 14.59 |
| | 9/2/93 | H 8.10 | | | 12.98 |
| | | L 8.10 | | | 12.98 |
| MW24-001 | 6/28/93 | H 5.58 | 12.0 | 17.15 | 11.57 |
| | | L 5.575 | | | 11.575 |
| | 9/2/93 | H 6.87 | | | 10.28 |
| | | L 6.88 | | | 10.27 |
| P4-001 | 6/28/93 | H 4.52 | 13.0 | 19.07 | 14.55 |
| | | L 4.70 | | | 14.37 |
| | 9/2/93 | H 6.02 | | | 13.05 |
| | | L 6.01 | | | 13.06 |
| P9-001 | 6/28/93 | H 4.75 | 13.0 | 17.20 | 12.45 |
| | | L 4.76 | | | 12.44 |
| | 9/2/93 | H 5.70 | | | 11.50 |
| | | L 5.71 | | | 11.49 |
| P15-001 | 6/28/93 | H 5.675 | 13.0 | 15.93 | 10.26 |
| | | L 5.69 | | | 10.24 |
| | 9/2/93 | H 6.76 | | | 9.17 |
| | | L 6.80 | | | 9.13 |
| DGW-03 | 6/28/93 | H 12.22 | 28.0 | 16.27 | 4.05 |
| | | L 12.40 | | | 3.87 |
| | 9/2/93 | H 13.18 | | | 3.09 |
| | | L 13.20 | | | 3.07 |
| EHW-12 | 6/28/93 | H 3.85 | 25.0 | 19.27 | 15.42 |
| | | L 3.92 | | | 15.34 |
| | 9/2/93 | H NM | | | NM |
| | | L NM | | | NM |
| EHW-13 | 6/28/93 | H 4.09 | 43.0 | 10.55 | 6.46 |
| | | L 4.10 | | | 6.45 |
| | 9/2/93 | H 5.08 | | | 5.47 |
| | | L 5.10 | | | 5.45 |

NOTES: Water levels were measured from the northside of each PVC casing.
* = Elevation data is the height in feet above mean sea level.
H = high tide
L = low tide
NM = not measured

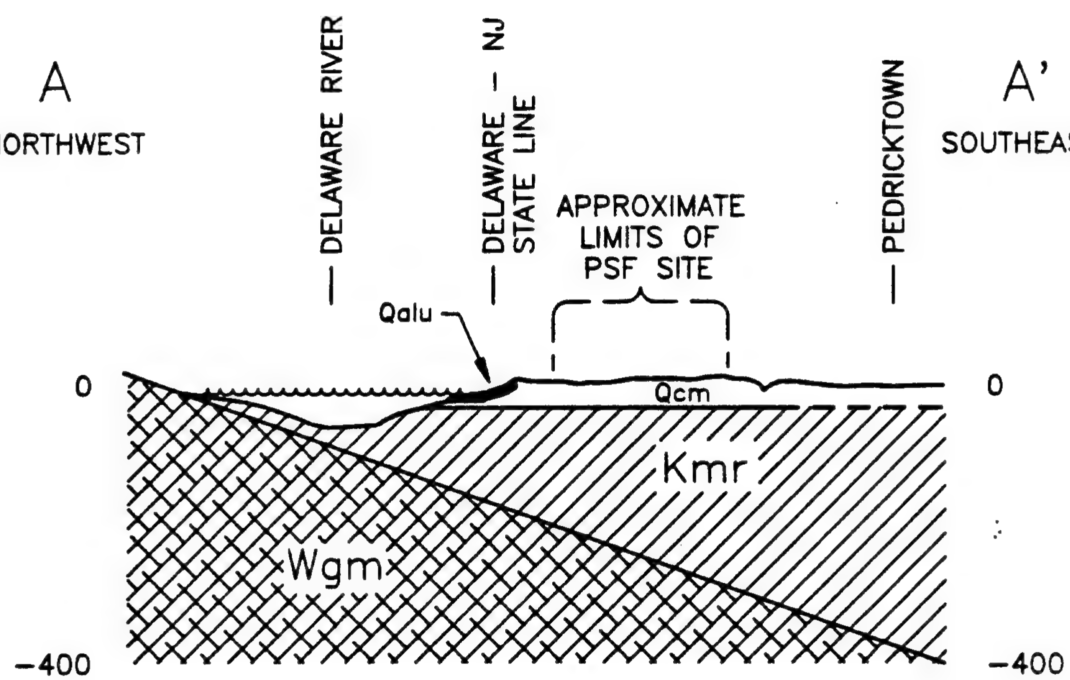
Table 2.3

SURFACE WATER FLUID LEVEL MEASUREMENTS
Pedricktown Support Facility
Salem County, New Jersey

| Surface Water Location | Date Measured | Depth to Water (ft) | Measuring Point Elevation* (ft) | Surface Water Elevation* (ft) |
|---|---|---|---|---|
| SW2-001 (North Swale) | 6/28/93 | H 4.46 | 12.11 | 7.65 |
| | | L 4.44 | | 7.67 |
| | 9/2/93 | H 4.56 | | 7.55 |
| | | L 4.56 | | 7.55 |
| SW13-001 (North Swale) | 6/28/93 | H NM | 5.51 | NM |
| | | L 2.22 | | 3.29 |
| | 9/2/93 | H 2.33 | | 3.18 |
| | | L 2.33 | | 3.18 |
| Lake | 6/28/93 | H 2.24 | 6.39 | 4.15 |
| | | L 2.20 | | 4.19 |
| | 9/2/93 | H 2.70 | | 3.69 |
| | | L 2.88 | | 3.51 |
| West Swale | 6/28/93 | H 1.78 | 4.88 | 3.10 |
| | | L 1.80 | | 3.08 |
| | 9/2/93 | H 2.00 | | 2.88 |
| | | L 2.00 | | 2.88 |
| Delaware River | 6/28/93 | H 1.50 | 5.25 | 3.75 |
| | | L 4.75 | 2.87 | -1.88 |
| | 9/2/93 | H 1.00 | 5.25 | 4.25 |
| | | L 4.33 | 2.87 | -1.46 |

NOTES:
NM - Not measured to surveyed stake.
H - high tide
L - low tide
*Elevation data is the height in feet above mean sea level.

| ERA | SYSTEM | EPOCH | FORMATION | DESCRIPTION |
|---|---|---|---|---|
| CENOZOIC | QUATERNARY | HOLOCENE | HOLOCENE UNDIFFERENTIATED ALLUVIUM | ORGANIC SOILS, MEDIUM TO COARSE SANDS, SILTS AND GRAVELS. |
| | | PLEISTOCENE | CAPE MAY FORMATION | MEDIUM TO COARSE QUARTZOSE SAND WITH ABUNDANT GRAVEL AND MINOR AMOUNTS OF CLAY. |
| MESOZOIC | CRETACEOUS | — | POTOMAC GROUP–RARITAN AND MAGOTHY FORMATIONS | MEDIUM TO FINE QUARTZ SANDS INTERBEDDED WITH VARIEGATED CLAYS |
| PRECAMBRIAN | — | — | WISSAHICKON FORMATION | SCHIST – GNEISS |




Kmr — POTOMAC GROUP – RARITAN AND MAGOTHY FORMATION

Wgm — WISSAHICKON FORMATION

Qalu — QUATERNARY HOLOCENE UNDIFFERENTIATED ALLUVIUM

Qcm — PLEISTOCENE CAPE MAY FORMATION

**NOTE:**
LINE OF SECTION IS SHOWN IN FIGURE 2.6.
DATUM IS MEAN SEA LEVEL.

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PEDRICKTOWN, NEW JERSEY


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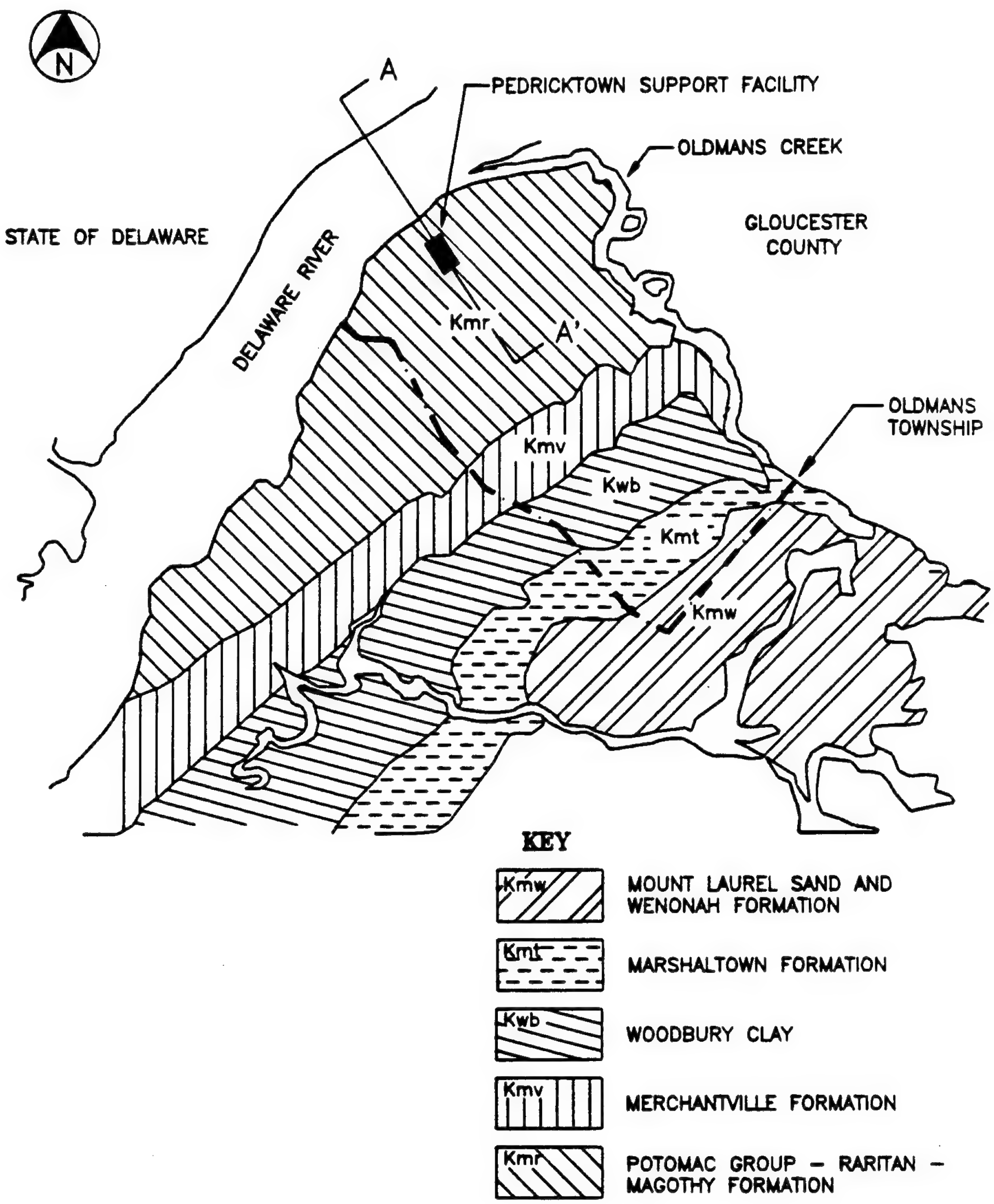
**FIGURE 2.1**
LOCALIZED STRATIGRAPHY OF THE PSF SITE

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# FIGURE 2.6

SURFICIAL CRETACEOUS GEOLOGY OF NORTHERN SALEM COUNTY


**KEY:**

Qalu - Quaternary Holocene Undifferentiated Alluvium

Qcm - Pleistocene Cape May Formation

Qps - Pensauken Formation

pQ - PreQuaternary, Tertiary or Cretaceous Formation

REFERENCE:
ROSENAU, LANG, HILTON AND ROONEY, – GEOLOGY AND GROUNDWATER RESOURCES OF SALEM COUNTY, NEW JERSEY, 1969

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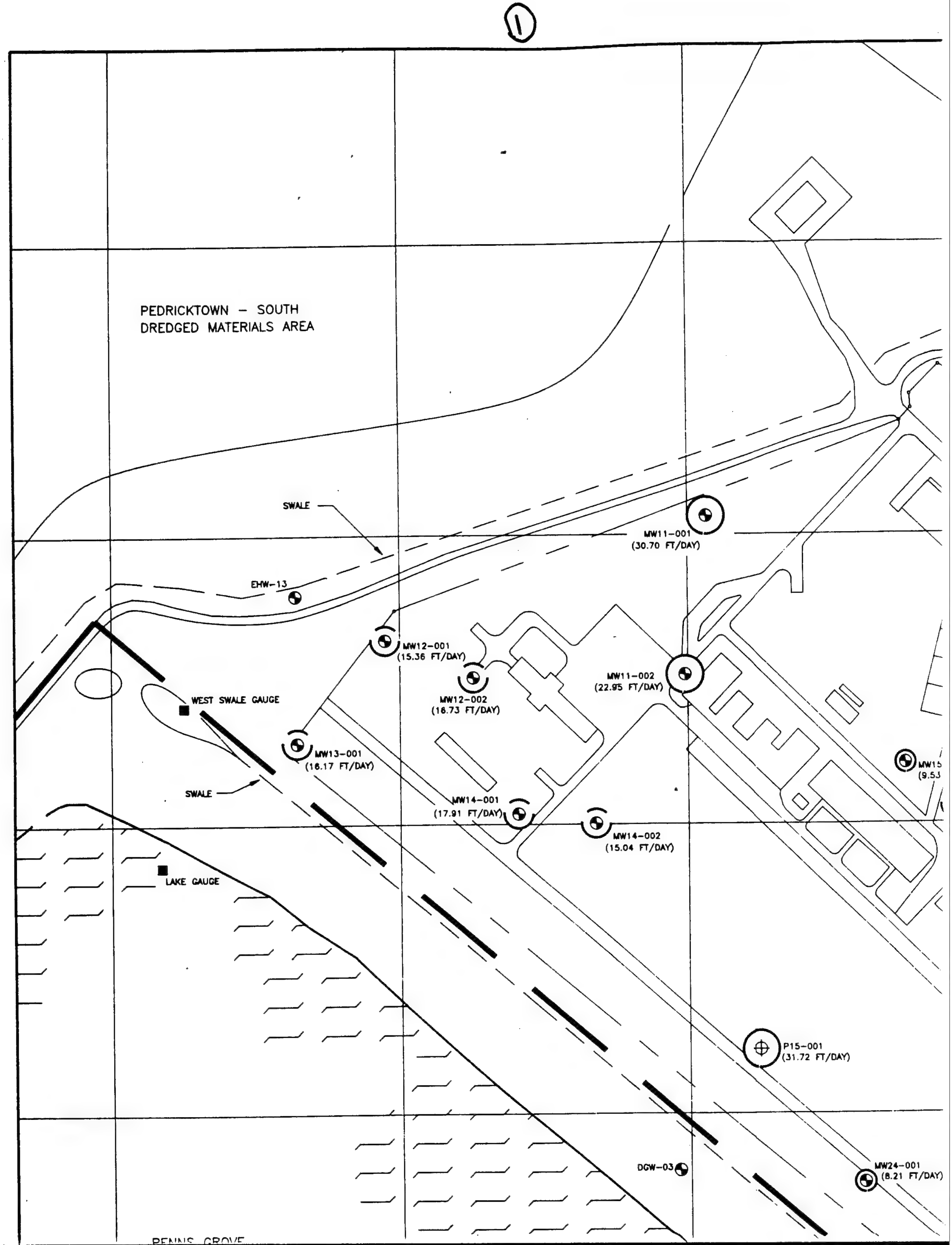
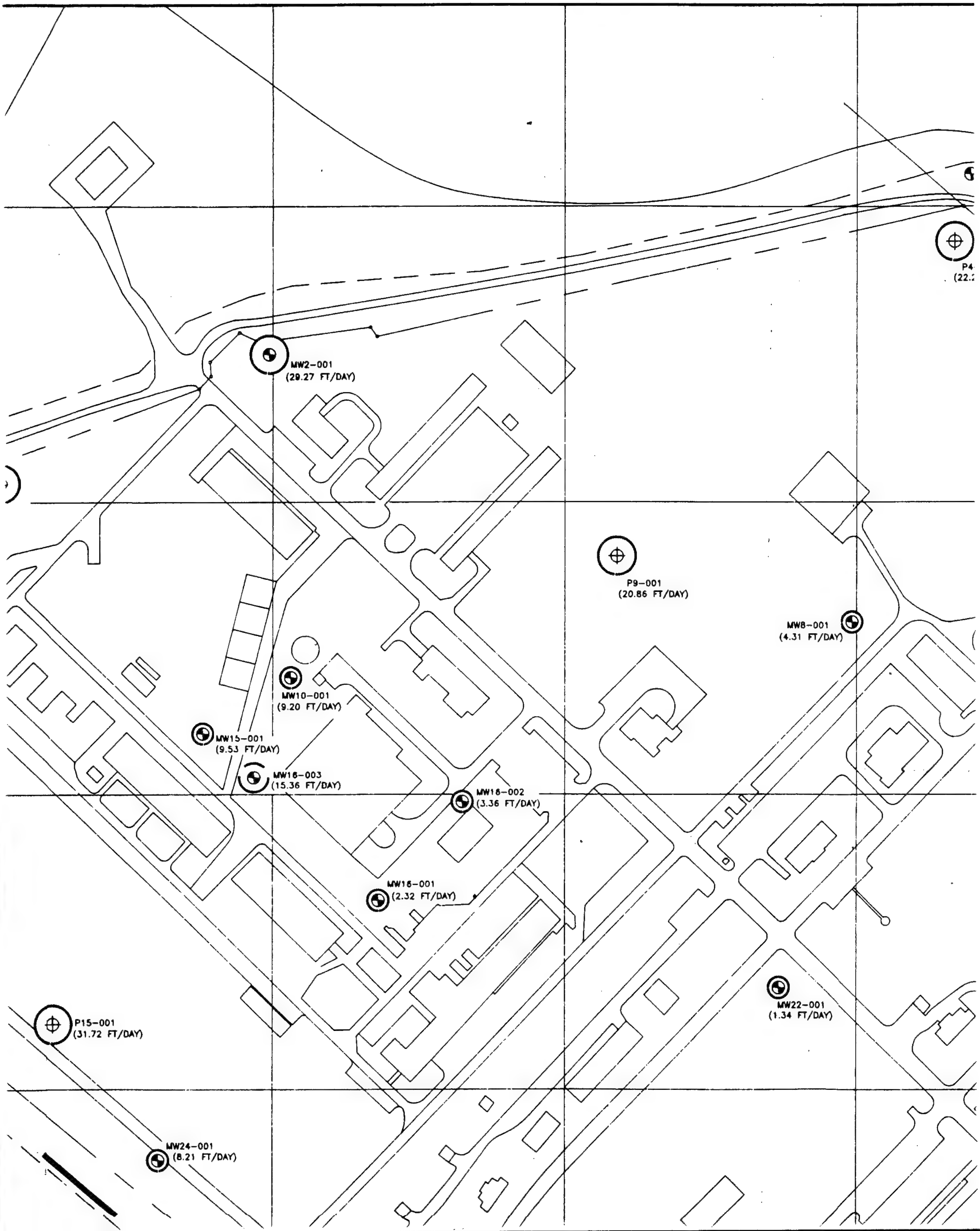
# FIGURE 2.7
SURFICIAL CENOZOIC GEOLOGY OF OLDMANS TOWNSHIP

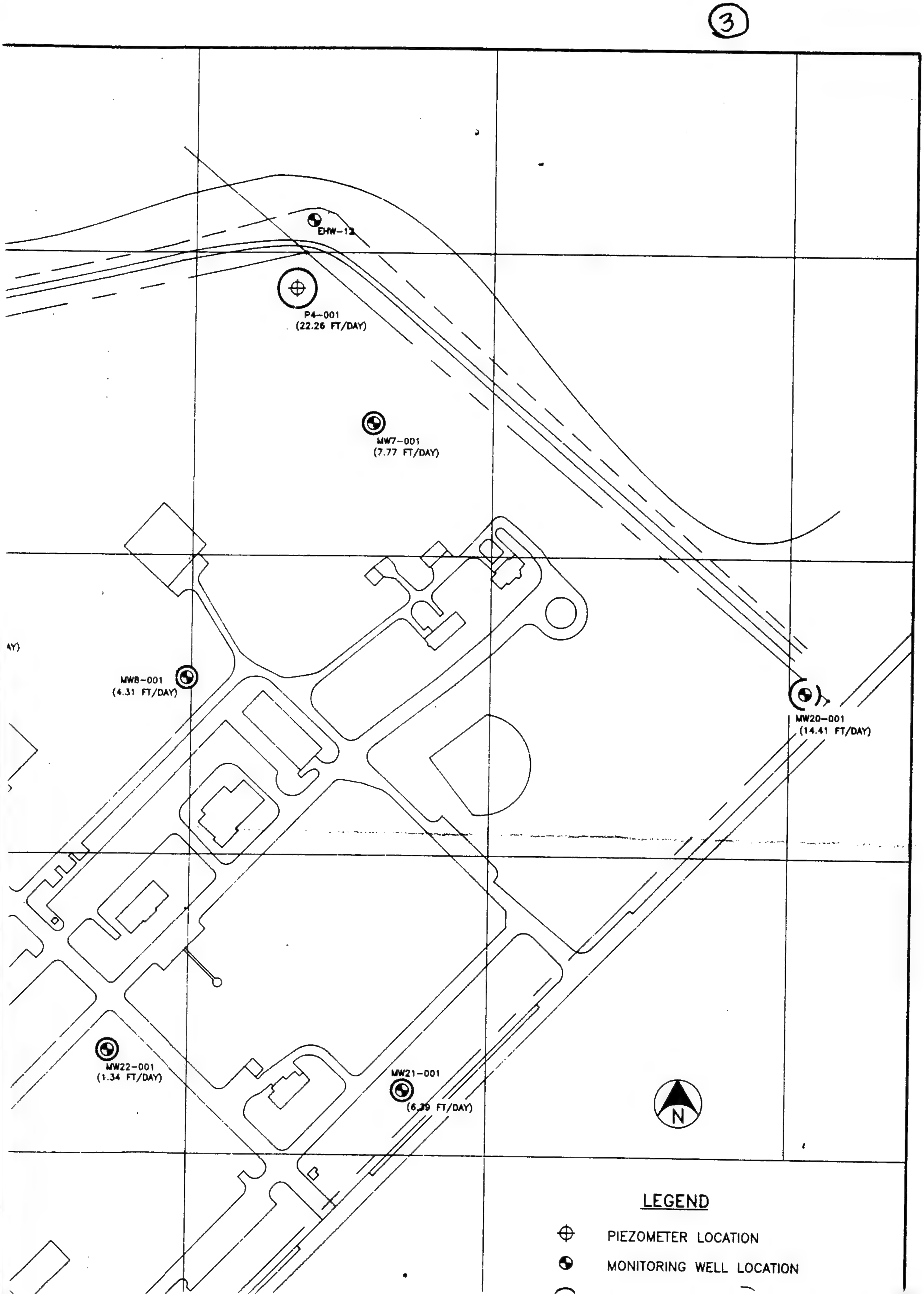


1
PEDRICKTOWN - SOUTH
DREDGED MATERIALS AREA
SWALE
EHW-13
MW11-001
(30.70 FT/DAY)
MW12-001
(15.36 FT/DAY)
MW12-002
(16.73 FT/DAY)
MW11-002
(22.95 FT/DAY)
WEST SWALE GAUGE
MW13-001
(16.17 FT/DAY)
SWALE
MW14-001
(17.91 FT/DAY)
MW14-002
(15.04 FT/DAY)
LAKE GAUGE
P15-001
(31.72 FT/DAY)
DGW-03
MW24-001
(8.21 FT/DAY)

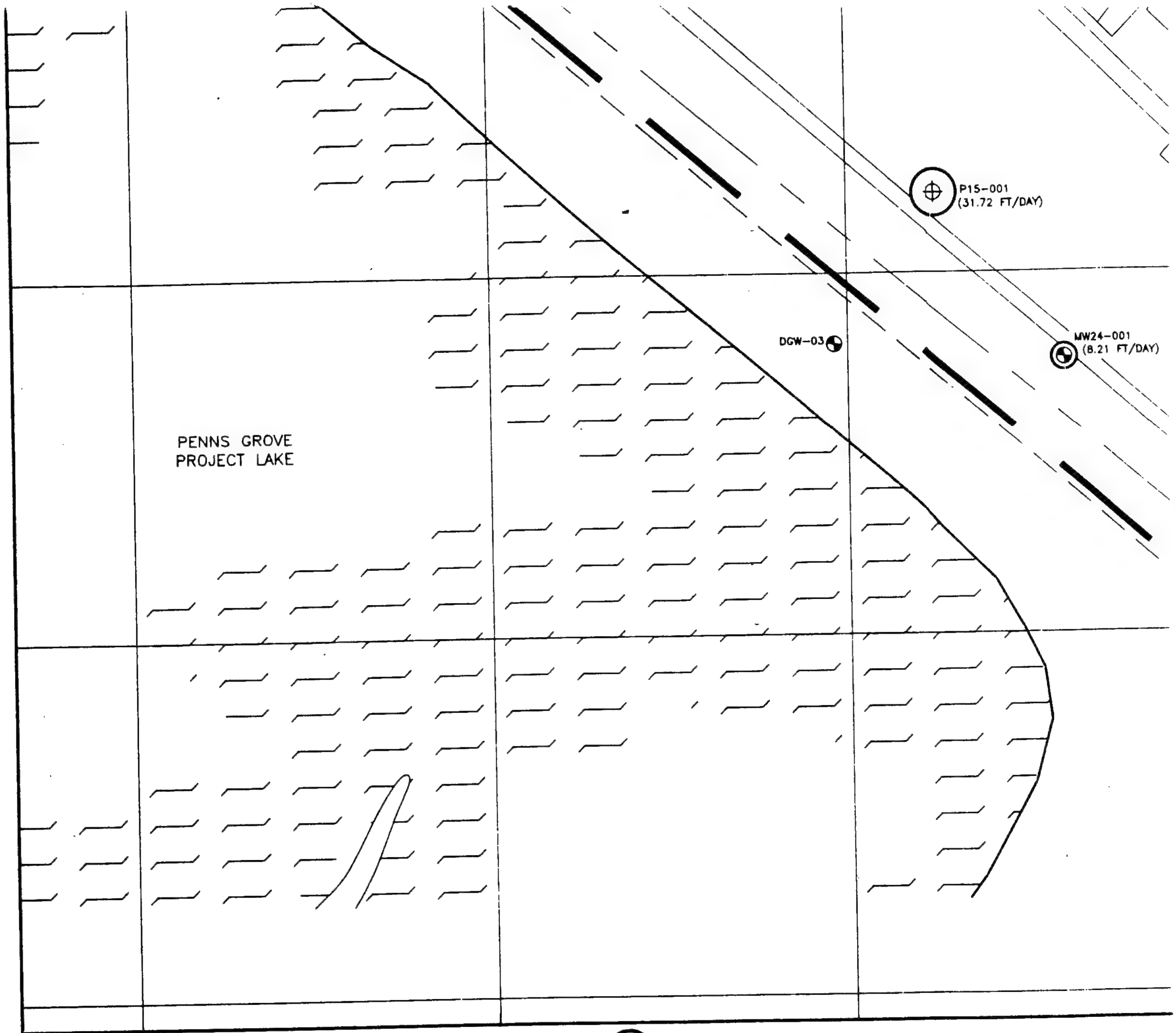
2

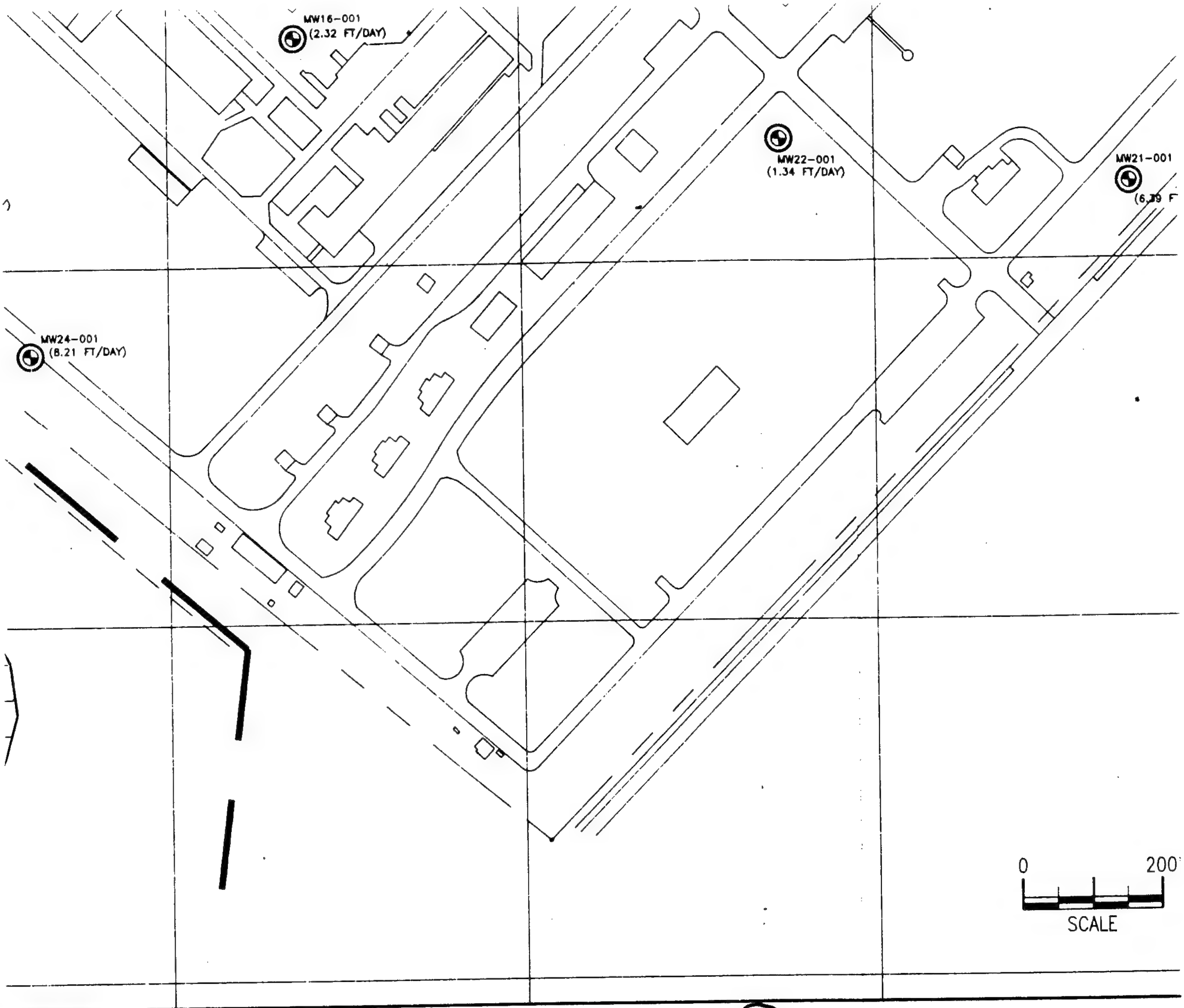


MW2-001
(29.27 FT/DAY)
P4
(22.
P9-001
(20.86 FT/DAY)
MW8-001
(4.31 FT/DAY)
MW10-001
(9.20 FT/DAY)
MW15-001
(9.53 FT/DAY)
MW16-003
(15.36 FT/DAY)
MW16-002
(3.36 FT/DAY)
MW16-001
(2.32 FT/DAY)
MW22-001
(1.34 FT/DAY)
P15-001
(31.72 FT/DAY)
MW24-001
(8.21 FT/DAY)



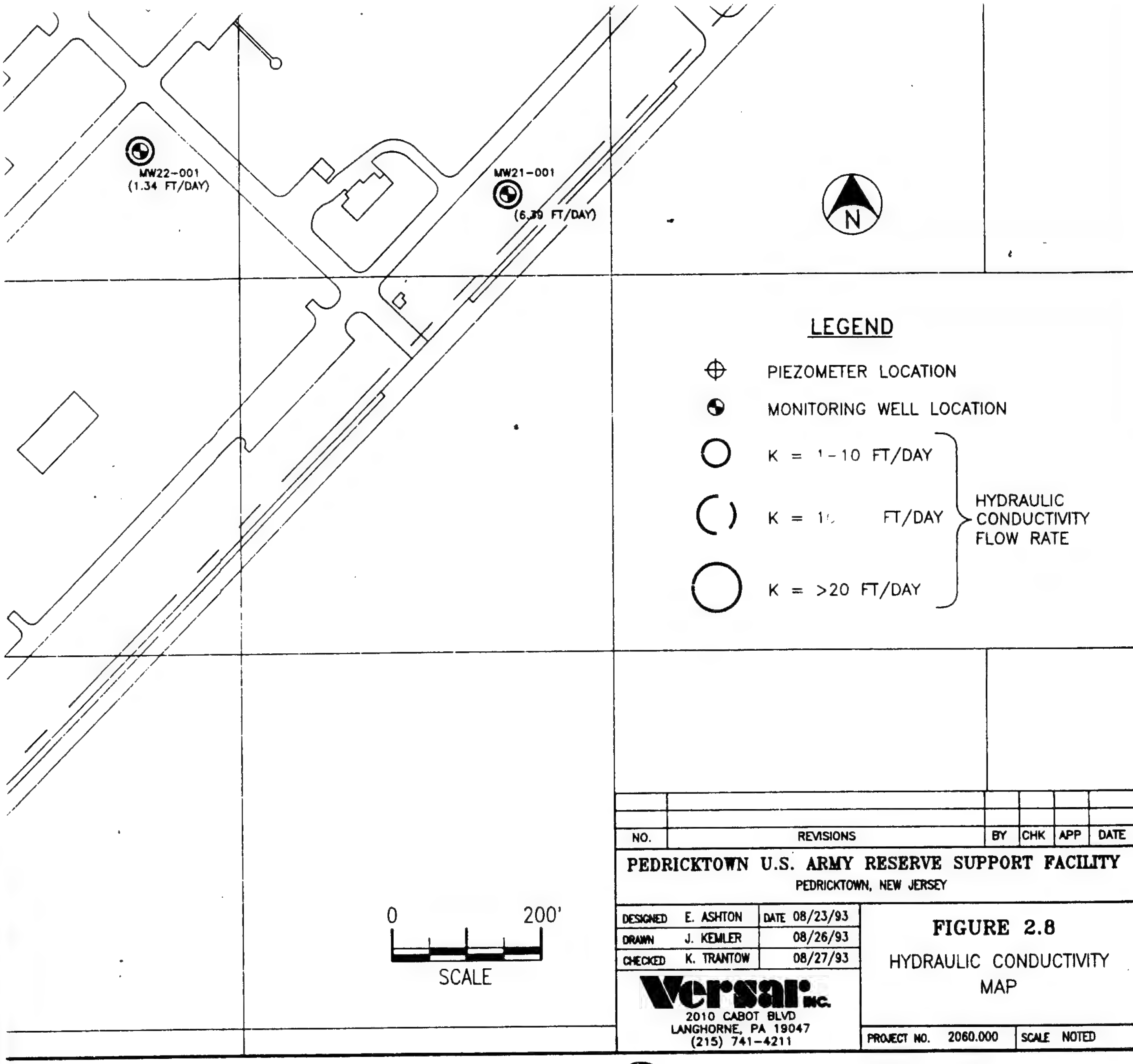
③
EHW-12
P4-001
(22.26 FT/DAY)
MW7-001
(7.77 FT/DAY)
MW8-001
(4.31 FT/DAY)
MW20-001
(14.41 FT/DAY)
MW22-001
(1.34 FT/DAY)
MW21-001
(6.39 FT/DAY)
N
LEGEND
PIEZOMETER LOCATION
MONITORING WELL LOCATION


P15-001
(31.72 FT/DAY)
DGW-03
MW24-001
(8.21 FT/DAY)
PENNS GROVE
PROJECT LAKE



MW16-001
(2.32 FT/DAY)
MW22-001
(1.34 FT/DAY)
MW21-001
MW24-001
(8.21 FT/DAY)
0
SCALE


5




| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | E. ASHTON | DATE 08/23/93 |
| DRAWN | J. KEMLER | 08/26/93 |
| CHECKED | K. TRANTOW | 08/27/93 |

**FIGURE 2.8**
HYDRAULIC CONDUCTIVITY MAP

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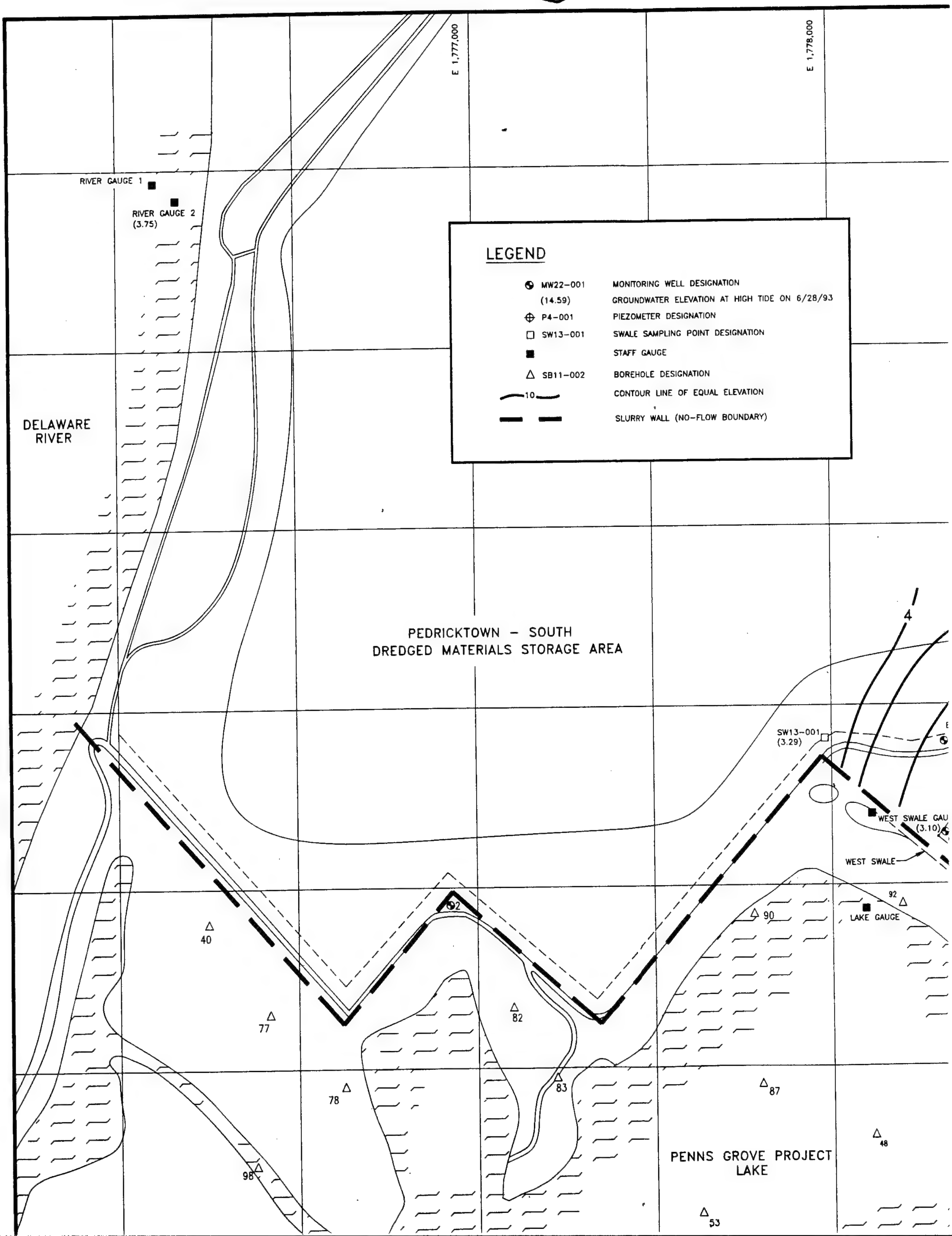
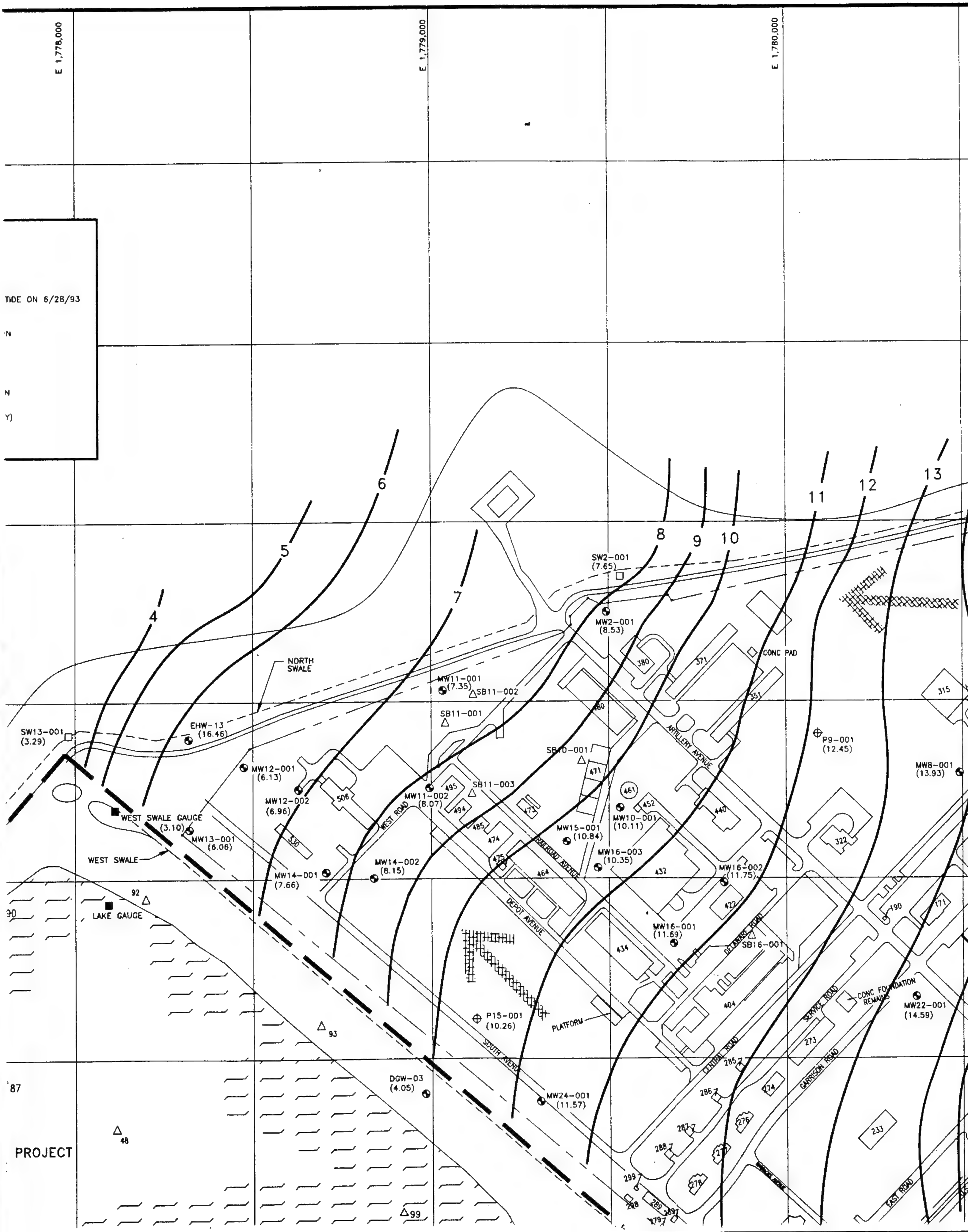
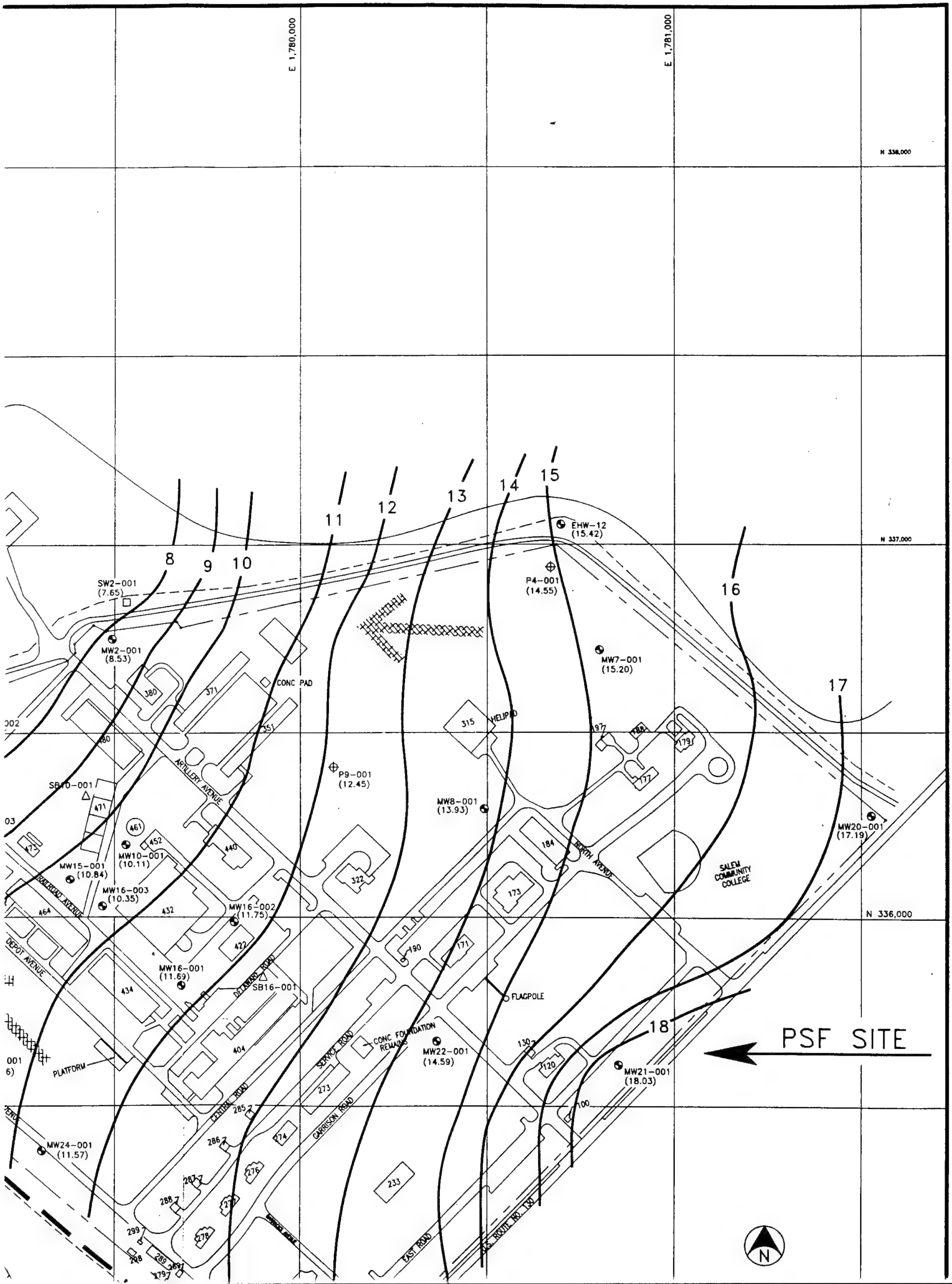
PROJECT NO. 2060.000 SCALE NOTED

1

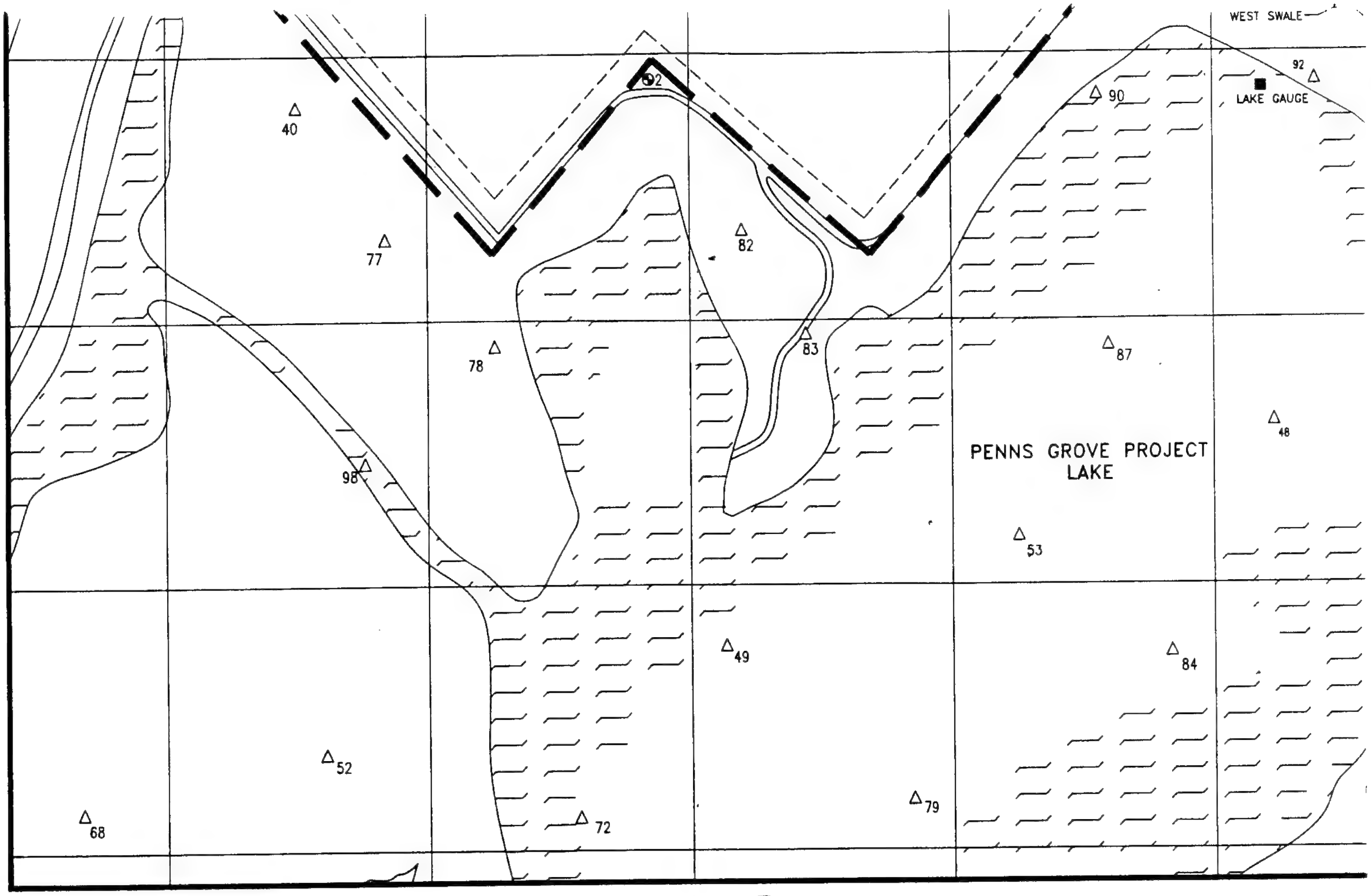

E 1,777,000
E 1,778,000
RIVER GAUGE 1
RIVER GAUGE 2
(3.75)
LEGEND
MW22-001 MONITORING WELL DESIGNATION
(14.59) GROUNDWATER ELEVATION AT HIGH TIDE ON 6/28/93
P4-001 PIEZOMETER DESIGNATION
SW13-001 SWALE SAMPLING POINT DESIGNATION
STAFF GAUGE
SB11-002 BOREHOLE DESIGNATION
10 CONTOUR LINE OF EQUAL ELEVATION
SLURRY WALL (NO-FLOW BOUNDARY)
DELAWARE RIVER
PEDRICKTOWN - SOUTH
DREDGED MATERIALS STORAGE AREA
4
SW13-001
(3.29)
WEST SWALE GAU
(3.10)
WEST SWALE
92
LAKE GAUGE
90
40
77
78
98
82
83
87
48
PENNS GROVE PROJECT LAKE
53

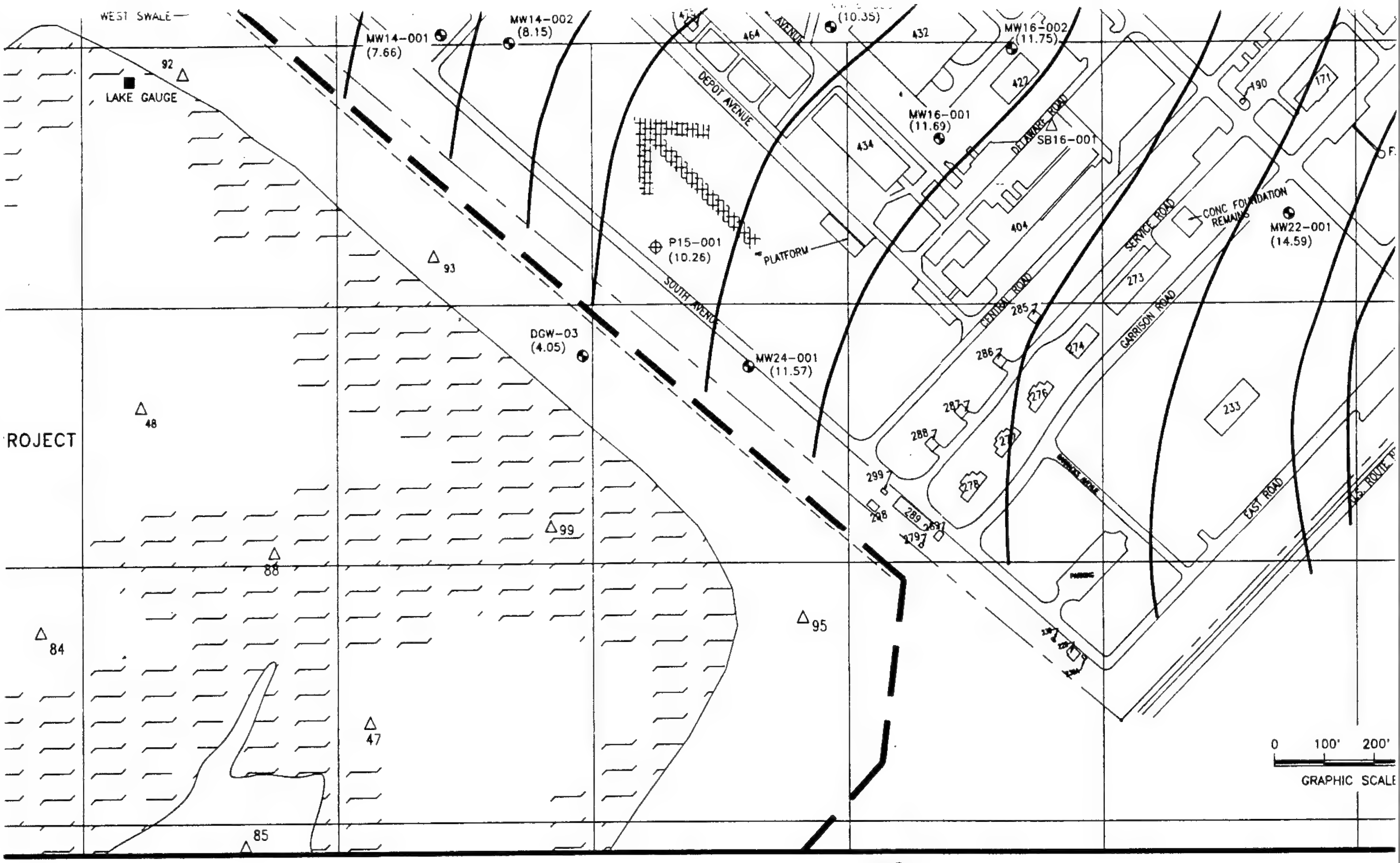
2


E 1,778,000
E 1,779,000
E 1,780,000
TIDE ON 6/28/93
N
N
Y)
4
5
6
7
8
9
10
11
12
13
NORTH SWALE
SW13-001 (3.29)
EHW-13 (16.46)
MW12-001 (6.13)
MW12-002 (6.96)
WEST SWALE GAUGE (3.10)
MW13-001 (6.06)
WEST SWALE
MW14-001 (7.66)
MW14-002 (8.15)
LAKE GAUGE
92
90
87
93
48
99
PROJECT
DGW-03 (4.05)
MW11-001 (7.35)
SB11-002
SB11-001
MW11-002 (8.07)
SB11-003
WEST ROAD
RAILROAD AVENUE
DEPOT AVENUE
SOUTH AVENUE
P15-001 (10.26)
PLATFORM
MW24-001 (11.57)
SW2-001 (7.65)
MW2-001 (8.53)
SB10-001
MW15-001 (10.84)
MW10-001 (10.11)
MW16-003 (10.35)
MW16-002 (11.75)
MW16-001 (11.69)
SB16-001
ARTILLERY AVENUE
DELAWARE ROAD
CENTRAL ROAD
SERVICE ROAD
GARRISON ROAD
EAST ROAD
CONC PAD
CONC FOUNDATION REMAINS
P9-001 (12.45)
MW8-001 (13.93)
MW22-001 (14.59)
315
380
371
351
480
471
461
452
440
322
506
495
494
485
474
475
473
464
530
432
422
434
404
190
171
273
233
285
286
274
276
287
288
278
299
289
279



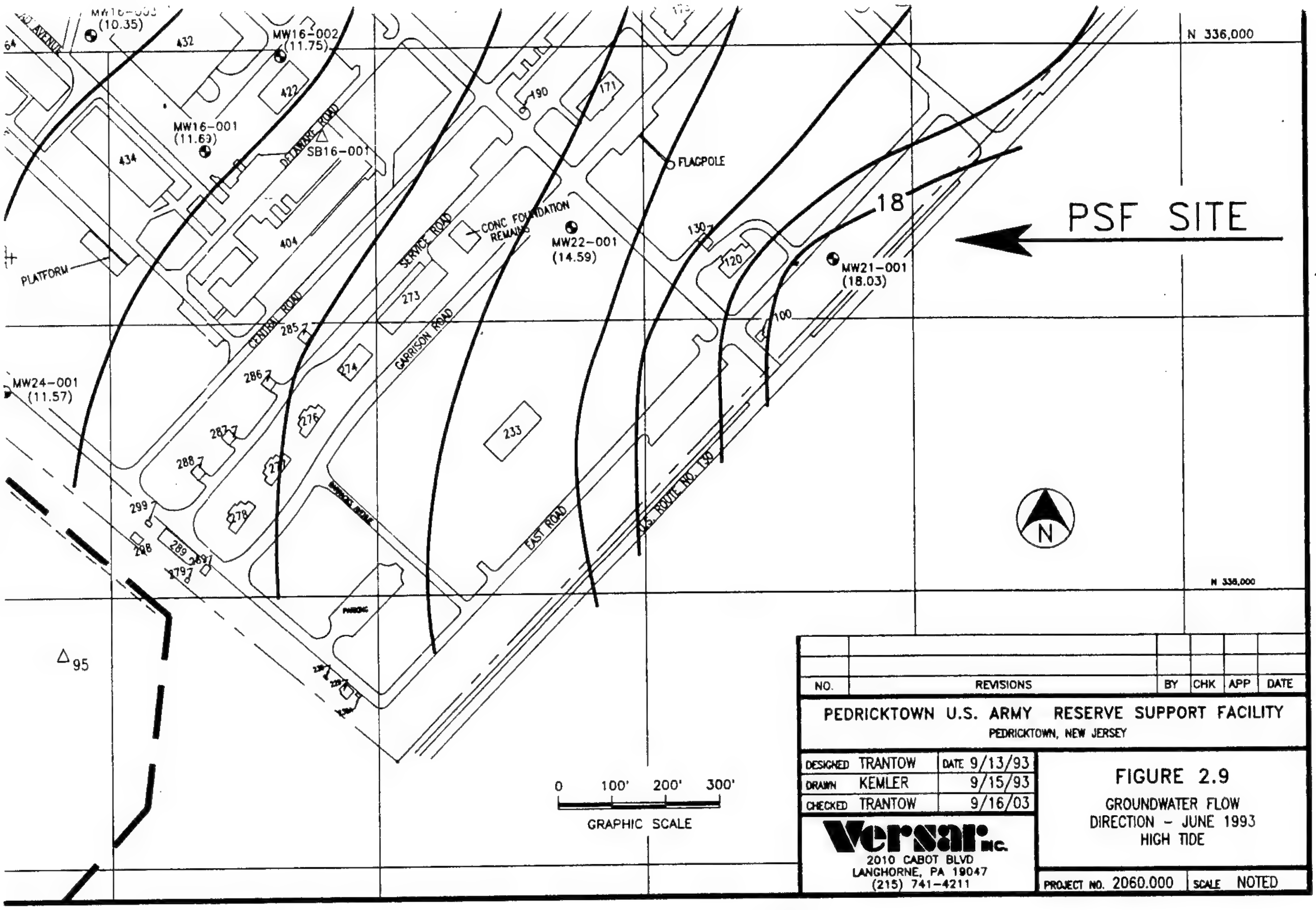
E 1,780,000
E 1,781,000
N 338,000
N 337,000
N 336,000
8
9
10
11
12
13
14
15
16
17
18
SW2-001
(7.65)
MW2-001
(8.53)
EHW-12
(15.42)
P4-001
(14.55)
MW7-001
(15.20)
P9-001
(12.45)
MW8-001
(13.93)
MW20-001
(17.19)
SB10-001
MW10-001
(10.11)
MW15-001
(10.84)
MW16-003
(10.35)
MW16-002
(11.75)
MW16-001
(11.69)
SB16-001
MW22-001
(14.59)
MW21-001
(18.03)
MW24-001
(11.57)
CONC PAD
HELIPAD
ARTILLERY AVENUE
RAILROAD AVENUE
DEPOT AVENUE
DELAWARE ROAD
NORTH AVENUE
SALEM COMMUNITY COLLEGE
FLAGPOLE
CONC FOUNDATION REMAINS
SERVICE ROAD
CENTRAL ROAD
GARRISON ROAD
EAST ROAD
U.S. ROUTE NO. 130
PLATFORM
PSF SITE
N


WEST SWALE
92
LAKE GAUGE
40
92
90
77
82
78
83
87
48
98
PENNS GROVE PROJECT
LAKE
53
49
84
52
68
72
79

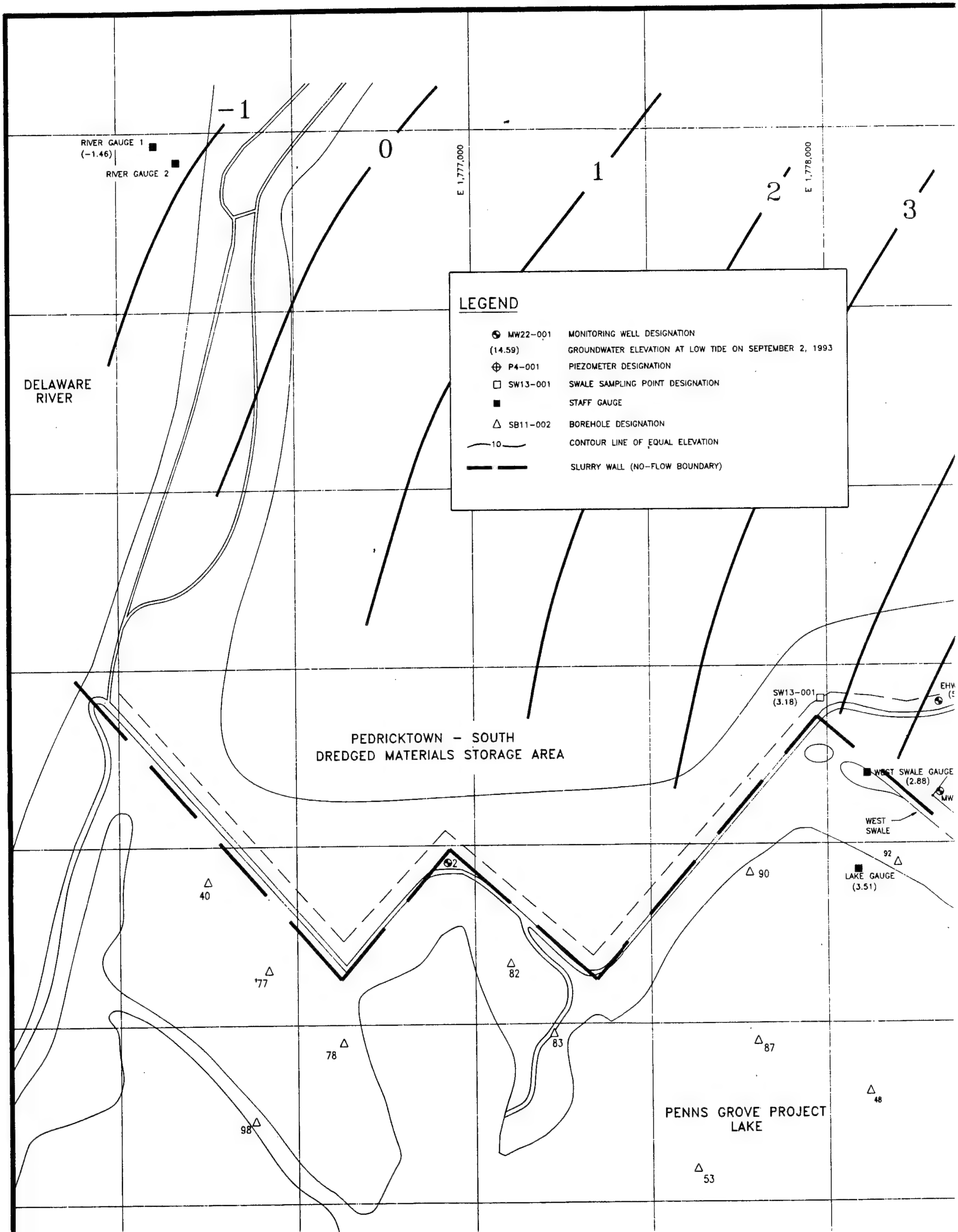


WEST SWALE
LAKE GAUGE
92
93
48
99
88
84
95
47
85
ROJECT
MW14-001
(7.66)
MW14-002
(8.15)
(10.35)
MW16-002
(11.75)
MW16-001
(11.69)
SB16-001
DEPOT AVENUE
SOUTH AVENUE
DELAWARE ROAD
CENTRAL ROAD
SERVICE ROAD
GARRISON ROAD
EAST ROAD
P15-001
(10.26)
PLATFORM
DGW-03
(4.05)
MW24-001
(11.57)
CONC FOUNDATION
REMAINS
MW22-001
(14.59)
464
432
422
434
404
273
285
286
274
276
287
288
233
299
289
190
171
0 100' 200'
GRAPHIC SCALE


5

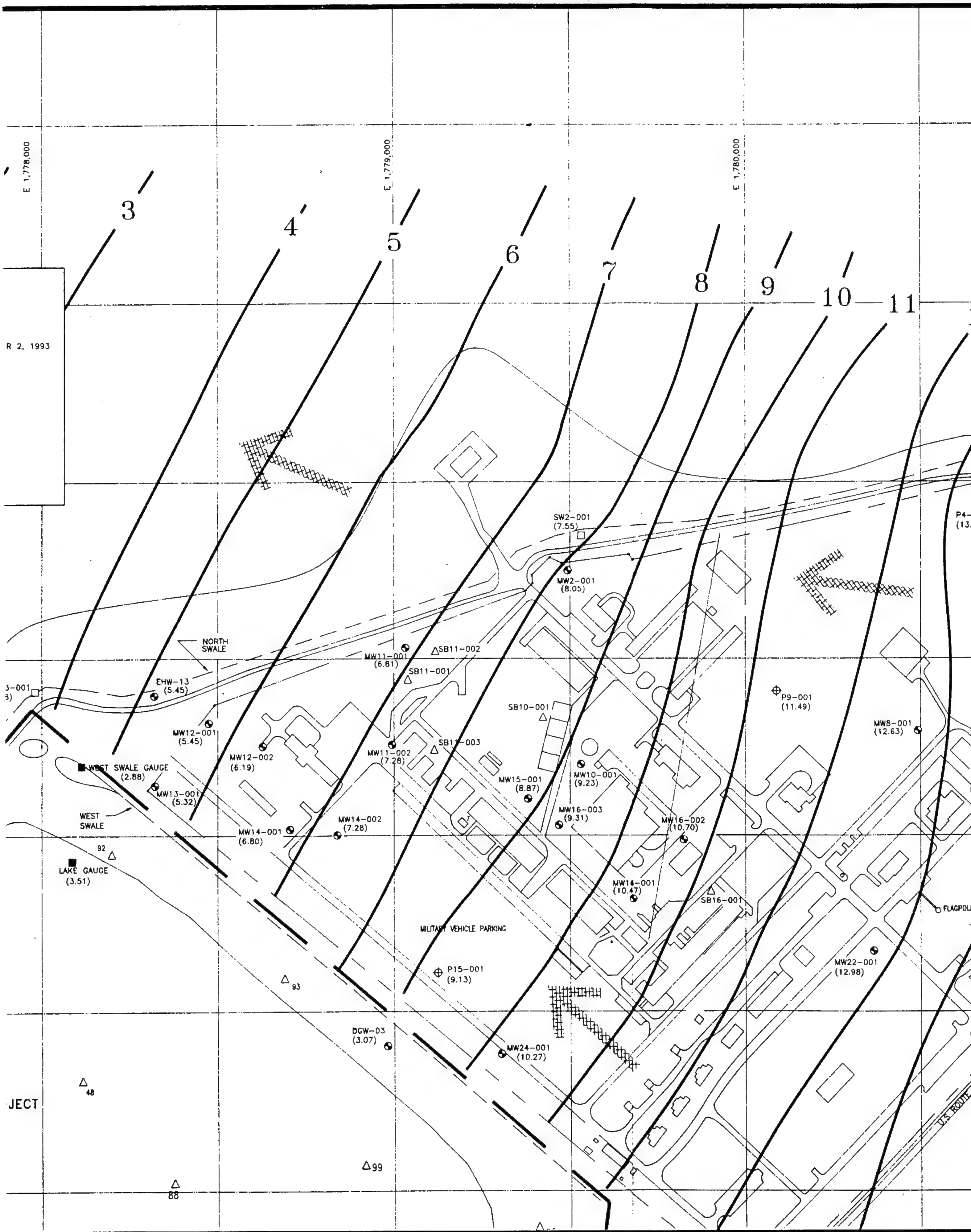


MW16-003
(10.35)
432
MW16-002
(11.75)
422
MW16-001
(11.69)
434
DELAWARE ROAD
SB16-001
404
PLATFORM
MW24-001
(11.57)
CENTRAL ROAD
285
286
287
288
299
298
289
279
274
276
277
278
273
SERVICE ROAD
GARRISON ROAD
CONC FOUNDATION REMAINS
MW22-001
(14.59)
233
EAST ROAD
190
171
FLAGPOLE
130
120
100
18
PSF SITE
MW21-001
(18.03)
U.S. ROUTE NO. 130
N 336,000
95
N
0
100'
200'
300'
GRAPHIC SCALE
NO.
REVISIONS
BY
CHK
APP
DATE
PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY
DESIGNED TRANTOW
DATE 9/13/93
DRAWN KEMLER
9/15/93
CHECKED TRANTOW
9/16/03
Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211
FIGURE 2.9
GROUNDWATER FLOW
DIRECTION - JUNE 1993
HIGH TIDE
PROJECT NO. 2060.000
SCALE NOTED



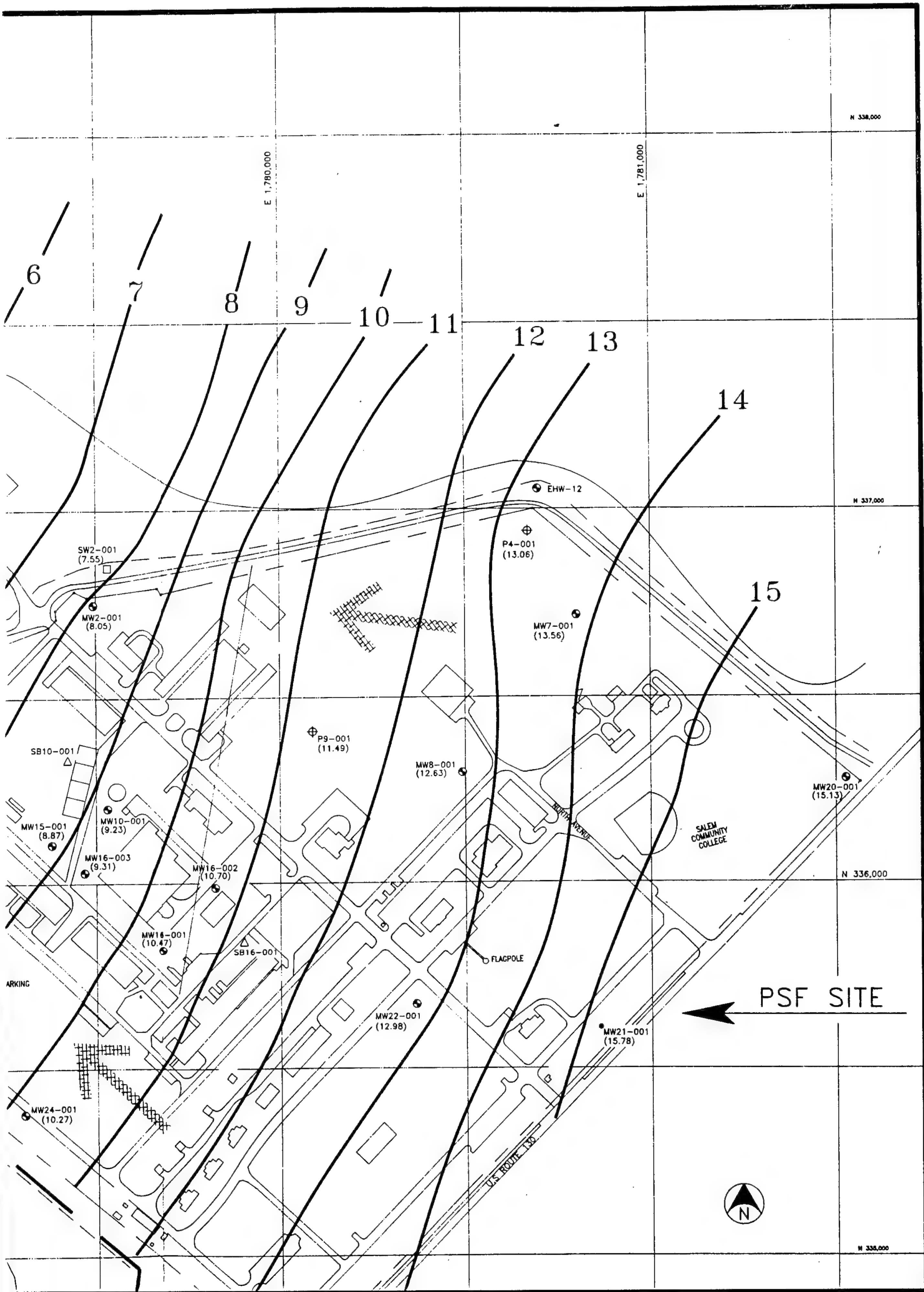
①
-1
0
1
2
3
RIVER GAUGE 1
(-1.46)
RIVER GAUGE 2
E 1,777,000
E 1,778,000
DELAWARE RIVER
LEGEND
MW22-001 MONITORING WELL DESIGNATION
(14.59) GROUNDWATER ELEVATION AT LOW TIDE ON SEPTEMBER 2, 1993
P4-001 PIEZOMETER DESIGNATION
SW13-001 SWALE SAMPLING POINT DESIGNATION
STAFF GAUGE
SB11-002 BOREHOLE DESIGNATION
10 CONTOUR LINE OF EQUAL ELEVATION
SLURRY WALL (NO-FLOW BOUNDARY)
SW13-001
(3.18)
PEDRICKTOWN - SOUTH
DREDGED MATERIALS STORAGE AREA
WEST SWALE GAUGE
(2.88)
WEST SWALE
LAKE GAUGE
(3.51)
40
77
82
90
92
78
83
87
98
48
53
PENNS GROVE PROJECT LAKE

②

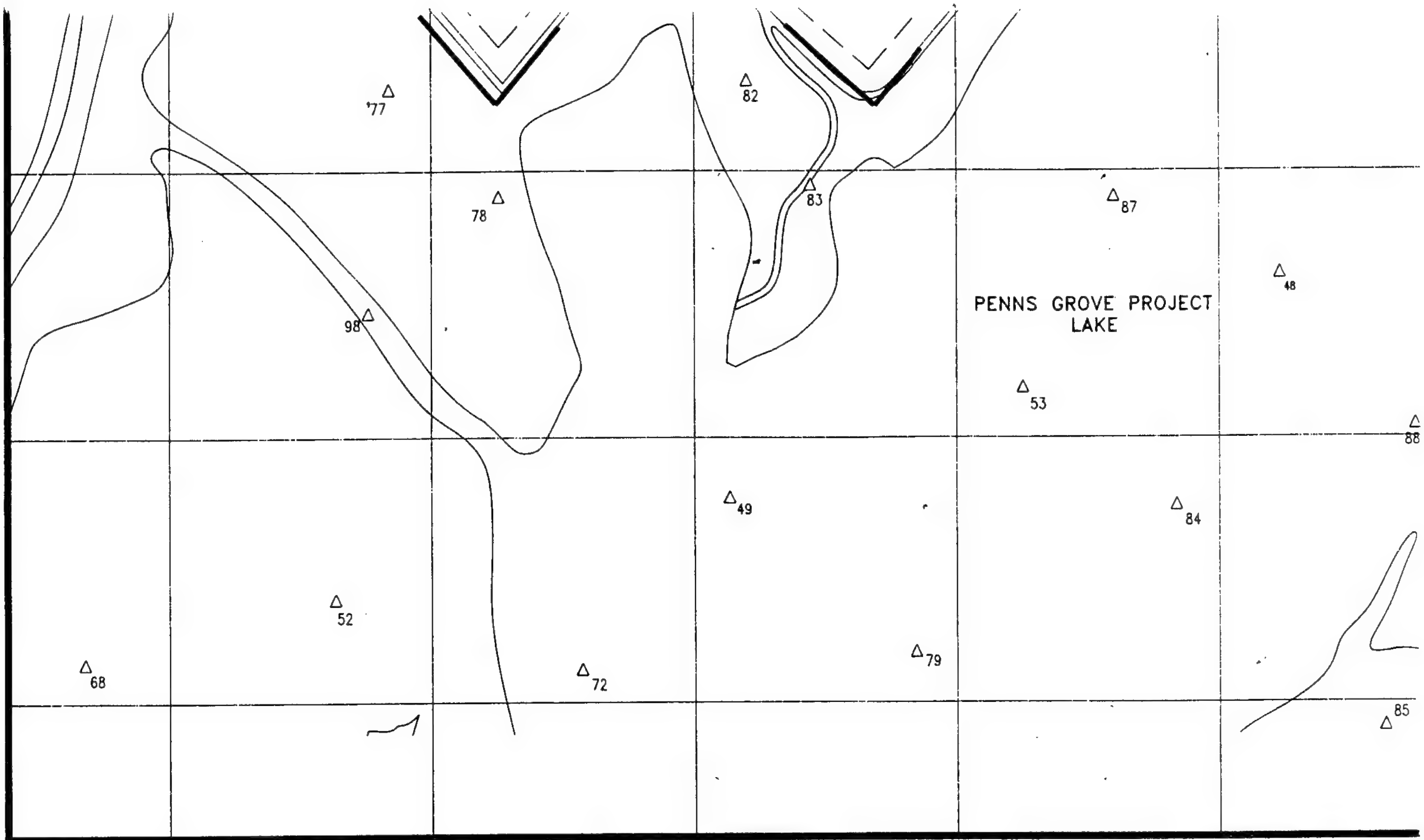


E 1,778,000
E 1,779,000
E 1,780,000
R 2, 1993
3
4
5
6
7
8
9
10
11
NORTH SWALE
EHW-13 (5.45)
MW12-001 (5.45)
MW12-002 (6.19)
WEST SWALE GAUGE (2.88)
MW13-001 (5.32)
WEST SWALE
LAKE GAUGE (3.51)
MW14-001 (6.80)
MW14-002 (7.28)
MW11-001 (6.81)
SB11-002
SB11-001
MW11-002 (7.28)
SB11-003
SW2-001 (7.55)
MW2-001 (8.05)
SB10-001
MW15-001 (8.87)
MW10-001 (9.23)
MW16-003 (9.31)
MW16-002 (10.70)
MW18-001 (10.47)
SB16-001
P9-001 (11.49)
MW8-001 (12.63)
MW22-001 (12.98)
FLAGPOLE
MILITARY VEHICLE PARKING
P15-001 (9.13)
DGW-03 (3.07)
MW24-001 (10.27)
JECT
U.S. ROUTE

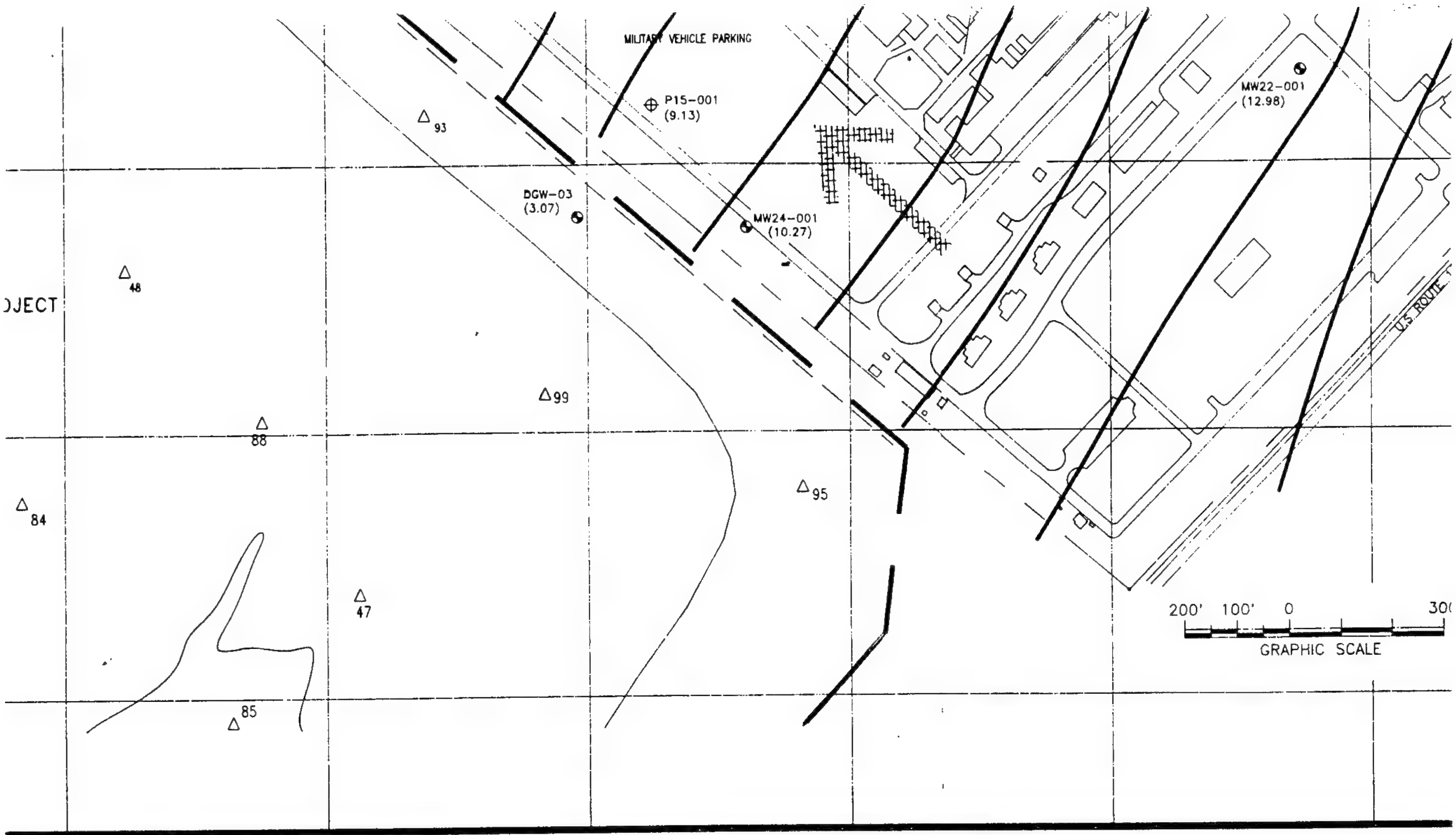
③



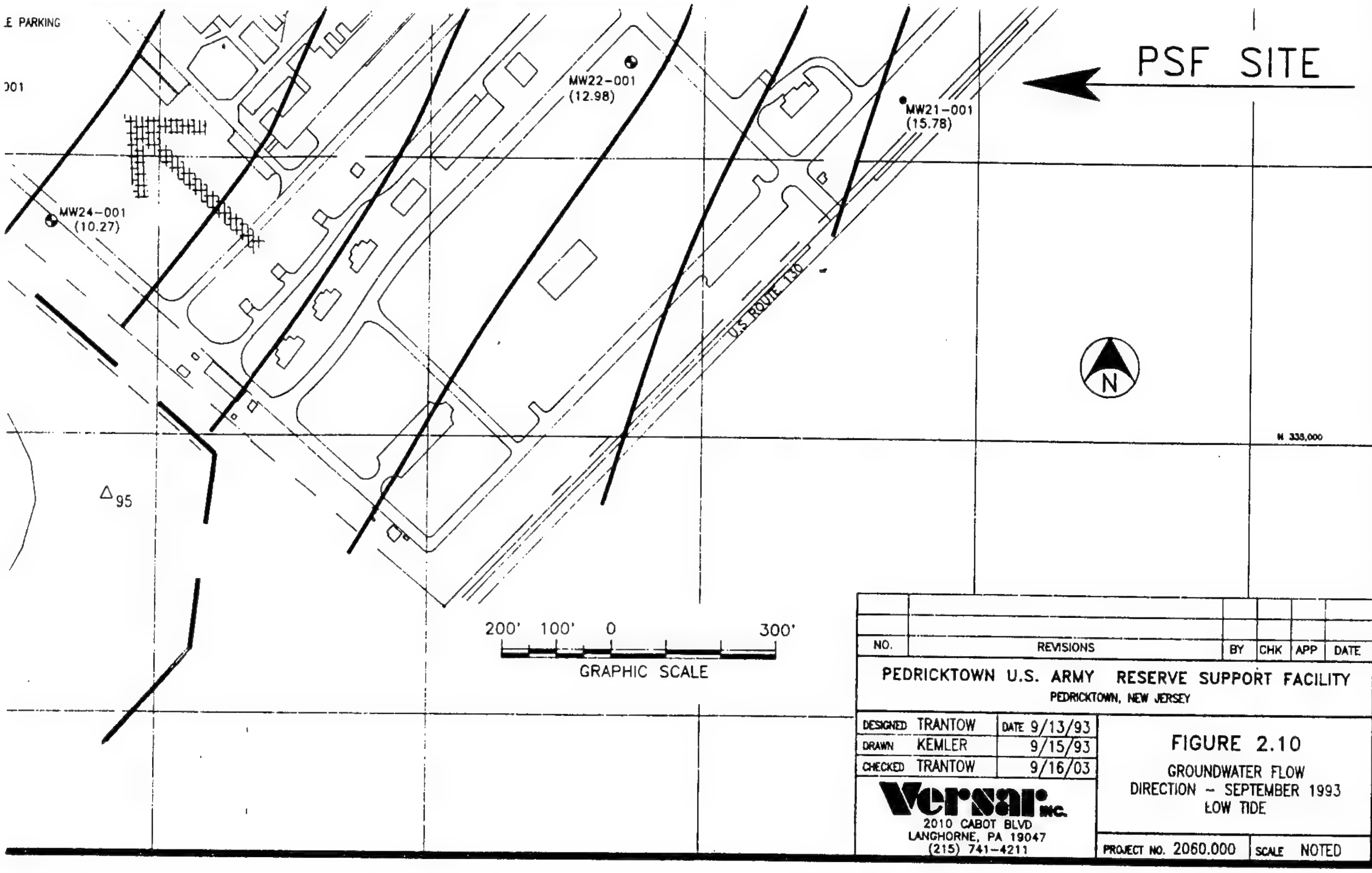
N 338,000
E 1,780,000
E 1,781,000
6
7
8
9
10
11
12
13
14
15
EHW-12
N 337,000
SW2-001
(7.55)
P4-001
(13.06)
MW2-001
(8.05)
MW7-001
(13.56)
P9-001
(11.49)
SB10-001
MW8-001
(12.63)
MW20-001
(15.13)
MW15-001
(8.87)
MW10-001
(9.23)
NORTH AVENUE
SALEM COMMUNITY COLLEGE
MW16-003
(9.31)
MW16-002
(10.70)
N 336,000
MW16-001
(10.47)
SB16-001
FLAGPOLE
ARKING
PSF SITE
MW22-001
(12.98)
MW21-001
(15.78)
MW24-001
(10.27)
U.S. ROUTE 130
N
N 335,000


77
82
78
83
87
48
PENNS GROVE PROJECT
LAKE
98
53
88
49
84
52
68
72
79
85

4


MILITARY VEHICLE PARKING
P15-001
(9.13)
93
DGW-03
(3.07)
MW24-001
(10.27)
MW22-001
(12.98)
48
)JECT
99
88
84
95
47
85
U.S ROUTE
200' 100' 0 30(
GRAPHIC SCALE

5




| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|

PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | TRANTOW | DATE 9/13/93 |
| DRAWN | KEMLER | 9/15/93 |
| CHECKED | TRANTOW | 9/16/03 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

**FIGURE 2.10**
GROUNDWATER FLOW DIRECTION – SEPTEMBER 1993 LOW TIDE

PROJECT NO. 2060.000 SCALE NOTED

## 3.0 SURFACE WATER

### 3.1 Drainage Patterns

Regional surface water hydrology is dominated by the Delaware River and its tributaries. The dominant surface water feature within Salem County is the Salem River, located approximately 5-6 miles south of PSF. Many portions along the Salem River are marshes, of which the largest, Pine Island Meadow, was created approximately 6 miles south of the site. Oldmans Creek, another tributary of the Delaware River, is located approximately 2 miles northeast of the site and also has associated marshlands. The source of Beaver Creek is located approximately 1 mile southeast of PSF. This creek drains into Oldmans Creek, and eventually into the Delaware.

Surface water features in the local site area include: small unnamed streams or swales along the northern and western site boundaries, the Penns Grove Project man-made lake directly southwest of the site, and the Delaware River approximately 0.75 miles west of the site. Within a 0.25-1.0 mile radius northeast and southeast of the site, many small marsh areas and swales drain into the Delaware. Staff gauges were placed in the river and lake and in both north and west swales bounding PSF in order to discover any hydrologic link between surface water and the water table on the site. The gauges were surveyed to tie in with the monitoring well elevations. From comparisons of groundwater and surface water elevations (8.05 feet above msl in MW2-001 and 7.55 feet above msl in SW2-001 at low tide on September 2, 1993), it is evident that the water table within the Cape May formation directly feeds the drainage swale bounding the north portion of the PSF site. Tables 2.2 and 2.3 summarize the synoptic fluid levels measured at PSF in the monitoring wells/piezometers and surface water bodies, respectively.

Surface water runoff from the PSF site is controlled by site topography which slopes gently to the north. The PSF site is separated from the Delaware River by the large plateau-like Pedricktown South dredged materials storage area as well as by the large berm surrounding the Penns Grove Project lake. Thus, surface runoff from PSF reaches the Delaware River only indirectly, via the drainage swales. The north swale flows from the northeast corner of PSF in a northwest direction along the northern site boundary, following the traprock road to the Delaware River. The west swale flows from the south corner of PSF northwest to intersect the north swale at the northwest corner of PSF. Surface

water runoff from PSF cannot enter the Penns Grove Project lake on the west because of the intervening west swale and berm.

The north swale receives runoff from the silt and clayey Pedricktown South dredged river materials, runoff from PSF, drainage from the west swale, and storm water discharge via the storm drains and connecting underground lines. The west swale reportedly drains into the north swale but does not flow as quickly as the north swale. There is often a stagnation of water in the west swale near the confluence of these swales (see West Swale gauge location on Figure 3.1).

Segments of both the north and west swales appear to have intermittent flow. Water within these portions is due only to precipitation, overland runoff, and the PSF storm water drainage system. The segment in the north swale which depicts apparent intermittent flow is from the eastern site boundary to approximately the SW2-001 surface water sampling location. Little or no flow was observed in the west swale during the field activities at PSF.

The remaining portion of the north swale (from SW2-001 to the Delaware River) exhibits apparent perennial base flow via groundwater exfiltration. Versar's field observations and groundwater modeling activities confirmed this finding.

Storm water and sewage treatment plant effluent from the PSF discharge to the Delaware River via a culverted outfall. Both the drainage swales and the underground sewer line exit PSF at its northwestern corner and follow the traprock road along the western side of Pedricktown South, to a culvert and outfall on the Delaware River (Figure 3.1 shows this outfall in the upper left corner along the Delaware). At the outfall to the river, a one-way outflow valve located on the culvert allows water to flow only into the Delaware and prevents the brackish Delaware River water from flowing back into the upstream portions of the swale. The storm/sewer water discharge system at PSF is depicted on Figure 3.2.

## 3.2 Flood Potential

Because of the high water table elevation in the site vicinity, as well as PSF's proximity to the Delaware River, the potential for flooding in the area is high. According to the Salem County Planning Board, the military installations in the Pedricktown area were not mapped by the National Flood Insurance Program. However, extrapolating from nearby regions along the Delaware, it is likely that the PSF site is also located within a 50-year flood plain zone. Furthermore, the

construction of the bentonite slurry wall surrounding Penns Grove Project lake has significantly elevated the local water table elevation. It is likely that this result was not taken into consideration in any of the floodplain map development in the area.

### 3.3 Site Surface Water Flow

Approximate surface water flow rates were determined at three different locations along the western portion of the north swale (near SW13-001) between PSF and the Pedricktown South dredged materials (Appendix A, Photograph 16). Testing was performed by Versar personnel on September 9, 1993, using the "chip test" method. This method was employed at three separate test locations along the north swale (Figure 3.1). Flow rates were calculated at each test location and ranged from 3.62 cubic feet per second ($ft^3$/sec) at test location #1 to 6.52 $ft^3$/sec at test location #2. The average flow rate along this section of the north swale was thus calculated to be 5.276 $ft^3$/sec, with the greatest flow occurring near SW13-001. No flow rates were calculated for the eastern part of the north swale (near SW2-001) or for the west swale, located along the Penns Grove Project man-made lake. Due to the lack of flow observed in these areas at the time of testing, velocities could not be determined.

### 3.4 Site Surface Water and Sediment Conditions

The objective of the surface water and sediment sampling activities was to evaluate potential impacts to surface water at the stormwater discharge point. Surface water and sediment samples were collected from five site stormwater catch basins located adjacent to potential AOCs and from two locations within the north swale (SW2-001 and SW13-001). Seven sampling locations were identified for sediment and surface water sampling; however, field conditions (e.g., inadequate sample volume) precluded the collection of a sediment sample from two of the seven locations. Surface water sample locations are depicted on Figure 3.2. Environmental Science and Engineering Laboratories (ESE), a USAEC-certified laboratory, completed the chemical analyses on all samples collected at PSF. Samples were analyzed for volatile organics (VOCs), semi-volatile organics (SVOCs), inorganics, total petroleum hydrocarbons (TPHCs), and explosive compounds (explosives were collected from select locations only). Original laboratory data are included in Appendix E, and chain-of-custody documentation is included in Appendix F.

Several factors should be taken into consideration with respect to surface water and sediment data: 1) Due to the high groundwater table there is believed

to be a relationship between groundwater and the north drainage swale (i.e., sample locations SW2-001 and SW13-001); 2) The surface water sampling was not conducted during a significant rain event and may not be fully representative of surface water runoff characteristics; 3) in addition to potential impacts to surface water and sediments from the PSF site, the north drainage swale is located at the base of a steeply sloping hill and collects runoff from dredged materials from an adjacent property; and 4) the volume of water contained in the north swale is negligible (approximately 0.039%) in comparison to the Delaware River, the ultimate discharge location.

### 3.4.1 Background Quality of Surface Water and Sediments

Based on site drainage patterns and the locations of the stormwater catch basins, background or "un-impacted" surface water and sediment conditions could not be established on-site.

### 3.4.2 Surface Water Quality

#### 3.4.2.1 Inorganic Compounds in Surface Water

Twenty-one inorganic compounds were detected in site surface water samples. A complete summary of compounds detected and the detected concentration is presented in Table 3.1. Original laboratory data are included as Appendix E. Magnesium, manganese, potassium, iron, sodium, barium, zinc, and calcium were detected in all 7 surface water samples collected. Vanadium was detected in 6 of the 7 samples; lead, arsenic, aluminum, titanium, cobalt, and copper were detected in 5 of the 7 samples; and cadmium and antimony were detected at a frequency of 4 out of 7. Nickel was detected in 3 samples; chromium was detected in 2 samples; and selenium and beryllium were detected in one sample only. A summary of the frequency of detection, percentage detected, maximum detected concentration, and average concentration of each parameter detected in at least one sample is presented in Table 3.2.

#### 3.4.2.2 Organic Compounds in Surface Water

The only organic compounds detected in surface water include: TPHCs, detected at a frequency of 6 out of 7 samples; tetrachloroethylene, found in one sample; and bis(2-ethylhexyl)phthalate, detected in 4 of the 7 samples. A summary of contaminant concentrations is presented in Table 3.1. Table 3.2 provides a summary of the statistical evaluation of contaminants in surface water.

3.4.2.3 Explosive Compounds in Surface Water

Nitrobenzene was detected in one of the surface water samples collected from the site. All other explosive compounds were below detection limits (Table 3.1).

3.4.2.4 Surface Water Data Comparison

An evaluation of surface water data indicates that there are no definitive contaminant distribution patterns. Since background surface water conditions could not be established at the site, no conclusions regarding site-related impacts and natural variability could be drawn. In general, sampling location SW17-001 was found to have the highest levels of contamination, consisting primarily of inorganic compounds. Locations SW16-001 and SW17-001 were sampled in order to evaluate potential impacts from the motor pool building. Elevated concentrations in SW17-001 may indicate some impacts from the motor pool building, but since this trend was not observed in SW16-001, no definite conclusions can be drawn. Surface water concentrations were generally found to be lowest in SW13-001, with the exception of PCE, which was detected solely at this location. SW13-001 is located along the north swale and represents the most downgradient surface water sampling point prior to off-site discharge and ultimate discharge to the Delaware River. The general trend of decreasing contaminant concentrations in sampling location SW13-001 indicates that on-site activities are not impacting the quality of off-site surface water drainage. However, the surface water samples may be more representative of groundwater quality than surface water runoff, because sampling was conducted during a relatively dry period.

The volume of water flowing through the north drainage swale is insignificant (approximately 0.039%) in comparison to the volume of flow in the Delaware River. Based on this volumetric disparity, no impact to surface water quality is anticipated from the discharge of surface runoff from the drainage swale to the river. Therefore, a comparison between ambient water quality criteria and runoff water was not conducted.

3.4.2.5 Potential Surface Water Transport Pathways

The only potential surface water transport pathway which may be associated with PSF is the discharge of surface water run-off from the site to the Delaware River. Based on the high volume of flow in the Delaware River relative to the drainage swale and the low concentrations of inorganic and organic compounds in surface water and swale sediments, this transport pathway is considered insignificant.

### 3.4.3 Sediment Quality

#### 3.4.3.1 Inorganic Compounds in Sediments

Twenty-one inorganic compounds were detected in on-site sediment samples. Lead, arsenic, aluminum, iron, magnesium, manganese, nickel, titanium, barium, chromium, cobalt, vanadium, zinc, and calcium were each detected at a frequency of 100 percent (i.e., 5 out of 5). Sodium, cadmium, and copper were found in 4 of the 5 sediment samples. Selenium and potassium were detected in 3 samples, and mercury and molybdenum were found in only one sample. A summary of sediment contaminant concentrations is presented in Table 3.3. A statistical evaluation of sediment data is presented in Table 3.4.

#### 3.4.3.2 Organic Compounds in Sediments

Twelve SVOCs and four VOCs were detected in on-site sediment samples. The following SVOCs were detected at the frequency indicated: benzo[b]fluoranthene (4 out of 5), fluoranthene (4 out of 5), chrysene (1 out of 5), anthracene (1 out of 5), pyrene (4 out of 5), benzo[a]pyrene (4 out of 5), benzo[a]anthracene (4 out of 5), acenaphthene (1 out of 5), phenanthrene (4 out of 5), fluorene (1 out of 5), 2-methylnapthalene (1 out of 5), and indeno[1,2,3-C,D]pyrene (3 out of 5). Volatile organic compounds detected included: ethylbenzene, xylenes, and methylene chloride detected in one sample and toluene detected in 2 samples. Table 3.3 provides a summary of sediment sample concentrations and Table 3.4 summarizes the statistical evaluation of sediment data.

#### 3.4.3.3 Explosive Compounds in Sediments

Analytical results for explosive compounds in sediments indicate that all parameters were below laboratory detection limits.

#### 3.4.3.4 Sediment Data Comparison

Concentrations of inorganic compounds detected in on-site sediments varied greatly throughout the site. Semi-volatile organic compounds were detected at much higher concentrations in SD10-001 than at the rest of the PSF site. Sample location SD10-001 is located downslope from the location of a suspected UST release. Elevated levels of SVOCs may be indicative of this suspected release. Volatile organic compounds, specifically BTEX, were found to be greatest in sample location SD16-001. This sample location was designed to evaluate potential impacts from the motor pool building. The contaminants of concern are indicative of gasoline, which was likely to be used in this area. The elevated organic compounds were not detected in SD13-001, which represents the most

downgradient site drainage sampling location, indicating that no transport of organic contaminants via sediments is occurring. Arsenic concentrations were highest in sample locations SD2-001 and SD13-001. These sampling points are located along the north swale and represent the most downgradient sediment sampling locations. Elevated levels of arsenic along the drainage swale indicate that the arsenic detected in the vicinity of the former scrap metal storage area may be migrating to the drainage swale via overland runoff.

#### 3.4.3.5 Potential Sediment Transport Pathways

The only possible sediment transport pathways are the discharge of impacted sediments to the north drainage swale, and ultimately to the Delaware River, and the leaching of sediments contained in the swale to the subsurface soils and groundwater. Based on the large volumetric differences between the drainage swale and the Delaware River, the sediment to surface water pathway is considered insignificant. Hydraulic relationships established at the site indicated that groundwater, if contaminated, would be more likely to impact water and sediment quality in the swale, than would storm water discharges. Groundwater seepage from the PSF site into the swale appears to be perennial, whereas storm water discharges are intermittent.

TABLE 3.1
SURFACE WATER ANALTICAL RESULTS (ppb)

| PARAMETER | SW2-001 | | SW10-001 | | SW13-001 | | SW14-001 | | SW16-001 | | SW17-001 | | SW18-001 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 420 | | 801 | LT | 200 | | 573 | | 1410 | | 7200 | | 14000 |
| Lead | LT | 4.54 | | 790 | LT | 4.54 | | 22.9 | | 12.3 | | 840 | | 260 |
| Arsenic | | 4 | | 34.4 | LT | 2 | | 5.86 | LT | 2 | | 25.4 | | 6.75 |
| Selenium | LT | 2.54 | | 5.18 | LT | 2.54 | LT | 2.54 | LT | 2.54 | LT | 2.54 | LT | 2.54 |
| Aluminum | LT | 200 | | 27000 | LT | 200 | | 2360 | | 423 | | 26000 | | 3010 |
| Iron | | 23000 | | 46000 | | 18000 | | 8700 | | 930 | | 81000 | | 7580 |
| Magnesium | | 90000 | | 12000 | | 67000 | | 6040 | | 964 | | 83000 | | 6840 |
| Manganese | | 30000 | | 337 | | 20000 | | 939 | | 52 | | 1050 | | 180 |
| Nickel | | 25.2 | | 66.1 | LT | 23.3 | LT | 23.3 | LT | 23.3 | | 117 | LT | 23.3 |
| Potassium | | 8280 | | 4810 | | 6990 | | 5920 | | 1500 | | 7170 | | 3070 |
| Sodium | | 62000 | | 10000 | | 52000 | | 4630 | | 5020 | | 40000 | | 18000 |
| Titanium | LT | 10 | | 631 | LT | 10 | | 62.4 | | 18.7 | | 908 | | 148 |
| Antimony | | 70.9 | | 39.2 | | 59.3 | LT | 25.1 | LT | 25.1 | | 63.1 | LT | 25.1 |
| Barium | | 33 | | 232 | | 44.2 | | 61.8 | | 16.2 | | 315 | | 74.3 |
| Beryllium | LT | 2 | | 3.58 | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |
| Cadmium | LT | 5 | | 6.61 | LT | 5 | LT | 5 | | 7.04 | | 60.3 | | 19.4 |
| Chromium | LT | 22.4 | | 100 | LT | 22.4 | LT | 22.4 | LT | 22.4 | | 105 | LT | 22.4 |
| Cobalt | | 113 | | 18.3 | | 59.1 | | 11.7 | LT | 10.8 | | 35.6 | LT | 10.8 |
| Copper | LT | 10 | | 188 | LT | 10 | | 28.4 | | 14.7 | | 342 | | 57.9 |
| Vanadium | | 10.4 | | 140 | | 8.29 | | 12.3 | LT | 7.62 | | 243 | | 16.8 |
| Zinc | | 72.5 | | 512 | | 110 | | 356 | | 38.7 | | 1600 | | 425 |
| Calcium | | 160000 | | 26000 | | 130000 | | 29000 | | 8100 | | 190000 | | 39000 |
| Tetrachloroethylene | LT | 2 | LT | 2 | | 7.4 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |

TABLE 3.1 (continued)
SURFACE WATER ANALTICAL RESULTS (ppb)

| PARAMETER | SW2-001 | | SW10-001 | | SW13-001 | | SW14-001 | | SW16-001 | | SW17-001 | | SW18-001 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 1 | | 1.7 | LT | 1 | LT | 1 | | 1.8 | | 1.2 | | 2.3 |
| Nitrobenzene | LT | 2.900 | LT | 2.900 | LT | 2.900 | LT | 2.900 | | 43.5 | LT | 2.900 | LT | 2.900 |

ppb = parts per billion or ug/l
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 3.2
STATISTICAL EVALUATION OF SURFACE WATER SAMPLES (ppb)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | MAXIMUM DETECTED CONCENTRATION | AVERAGE CONCENTRATION |
|---|---|---|---|---|
| Total petroleum hydrocarbons | 6 /7 | 86 | 14000 | 3500.57 |
| Lead | 5 /7 | 71 | 840 | 275.68 |
| Arsenic | 5 /7 | 71 | 34.4 | 11.20 |
| Selenium | 1 /7 | 14 | 5.18 | 1.83 |
| Aluminum | 5 /7 | 71 | 27000 | 8427.57 |
| Iron | 7 /7 | 100 | 81000 | 26458.57 |
| Magnesium | 7 /7 | 100 | 90000 | 37977.71 |
| Manganese | 7 /7 | 100 | 30000 | 7508.29 |
| Nickel | 3 /7 | 43 | 117 | 36.41 |
| Potassium | 7 /7 | 100 | 8280 | 5391.43 |
| Sodium | 7 /7 | 100 | 62000 | 27378.57 |
| Titanium | 5 /7 | 71 | 908 | 254.01 |
| Antimony | 4 /7 | 57 | 70.9 | 38.59 |
| Barium | 7 /7 | 100 | 315 | 110.93 |
| Beryllium | 1 /7 | 14 | 3.58 | 1.37 |
| Cadmium | 4 /7 | 57 | 60.3 | 14.41 |
| Chromium | 2 /7 | 29 | 105 | 37.29 |
| Cobalt | 5 /7 | 71 | 113 | 35.50 |
| Copper | 5 /7 | 71 | 342 | 91.57 |
| Vanadium | 6 /7 | 86 | 243 | 62.09 |
| Zinc | 7 /7 | 100 | 1600 | 444.89 |
| Calcium | 7 /7 | 100 | 190000 | 83157.14 |
| Tetrachloroethylene | 1 /7 | 14 | 7.4 | 1.91 |

TABLE 3.2 (continued)
STATISTICAL EVALUATION OF SURFACE WATER SAMPLES (ppb)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | MAXIMUM DETECTED CONCENTRATION | AVERAGE CONCENTRATION |
|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 4 /7 | 57 | 2.3 | 1.21 |
| Nitrobenzene | 1 /7 | 14 | 43.5 | 7.46 |

ppb = parts per billion or ug/l
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 3.3
SEDIMENT ANALYTICAL RESULTS (ppm)

| PARAMETER | SD2-001 | | SD10-001 | | SD13-001 | | SD16-001 | | SD17-001 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 355 | | 2380 | | 991 | | 3890 | | 1640 |
| Mercury | | 0.145 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 |
| Lead | | 31.1 | | 280 | | 56 | | 140 | | 81 |
| Arsenic | | 49 | | 4.97 | | 26.3 | | 3.5 | | 2.12 |
| Selenium | | 1.33 | | 1.27 | | 1.14 | LT | 0.202 | LT | 0.202 |
| Aluminum | | 8230 | | 5300 | | 6290 | | 2240 | | 2460 |
| Iron | | 230000 | | 8190 | | 270000 | | 5290 | | 13000 |
| Magnesium | | 2270 | | 1140 | | 2510 | | 1920 | | 45000 |
| Manganese | | 1310 | | 48.4 | | 1680 | | 116 | | 139 |
| Molybdenum | LT | 1 | | 2.93 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | | 14.6 | | 20.5 | | 14.9 | | 5.99 | | 7.38 |
| Potassium | LT | 119 | | 662 | LT | 119 | | 267 | | 220 |
| Sodium | | 290 | | 173 | | 530 | | 141 | LT | 44.8 |
| Titanium | | 176 | | 164 | | 146 | | 251 | | 108 |
| Barium | | 49.9 | | 44.6 | | 49.8 | | 61.2 | | 23.7 |
| Cadmium | | 2.68 | | 2.93 | LT | 0.515 | | 7 | | 3.1 |
| Chromium | | 15.5 | | 34.2 | | 9.71 | | 21.1 | | 5.92 |
| Cobalt | | 45.7 | | 6.89 | | 52.8 | | 2.78 | | 5.05 |
| Copper | LT | 0.937 | | 82.9 | | 26.9 | | 18 | | 26 |
| Vanadium | | 16.6 | | 40.1 | | 16.1 | | 9.63 | | 12 |
| Zinc | | 231 | | 128 | | 277 | | 91.1 | | 75.1 |

TABLE 3.3 (continued)
SEDIMENT ANALYTICAL RESULTS (ppm)

| PARAMETER | SD2-001 | | SD10-001 | | SD13-001 | | SD16-001 | | SD17-001 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | | 4820 | | 2340 | | 5820 | | 8800 | | 95000 |
| Benzo[b]fluoranthene | | 0.71 | | 6 | LT | 0.2 | | 1 | | 0.8 |
| Fluoranthene | | 0.57 | | 6 | LT | 0.4 | | 3 | | 0.4 |
| Chrysene | LT | 0.22 | | 2 | LT | 1 | LT | 1 | LT | 0.7 |
| Anthracene | LT | 0.033 | | 0.7 | LT | 0.2 | LT | 0.2 | LT | 0.1 |
| Pyrene | | 0.47 | | 5 | LT | 0.2 | | 2 | | 0.6 |
| Benzo[a]pyrene | | 0.44 | | 4 | LT | 0.2 | | 1 | | 0.5 |
| Benzo[a]anthracene | | 0.33 | | 2 | LT | 0.2 | | 1 | | 0.2 |
| Acenaphthene | LT | 0.033 | | 0.3 | LT | 0.2 | LT | 0.2 | LT | 0.1 |
| Phenanthrene | | 0.33 | | 3 | LT | 0.2 | | 3 | | 0.3 |
| Fluorene | LT | 0.033 | | 0.3 | LT | 0.2 | LT | 0.2 | LT | 0.1 |
| 2-Methylnaphthalene | LT | 0.033 | LT | 0.1 | LT | 0.2 | | 10 | LT | 0.1 |
| Indeno[1,2,3-C,D]pyrene | | 0.24 | | 2 | LT | 0.2 | LT | 0.2 | | 0.4 |
| Ethylbenzene | LT | 0.002 | LT | 0.002 | LT | 0.002 | | 1.5 | LT | 0.002 |
| Toluene | LT | 0.002 | | 0.004 | LT | 0.002 | | 0.5 | LT | 0.002 |
| Xylenes | LT | 0.002 | LT | 0.002 | LT | 0.002 | | 5.9 | LT | 0.002 |
| Methylene chloride / Dichloromethane | LT | 0.04 | | 0.14 | LT | 0.04 | LT | 0.2 | LT | 0.04 |

ppm - parts per million or ug/g
LT - Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 3.4
STATISTICAL EVALUATION OF SEDIMENT SAMPLES

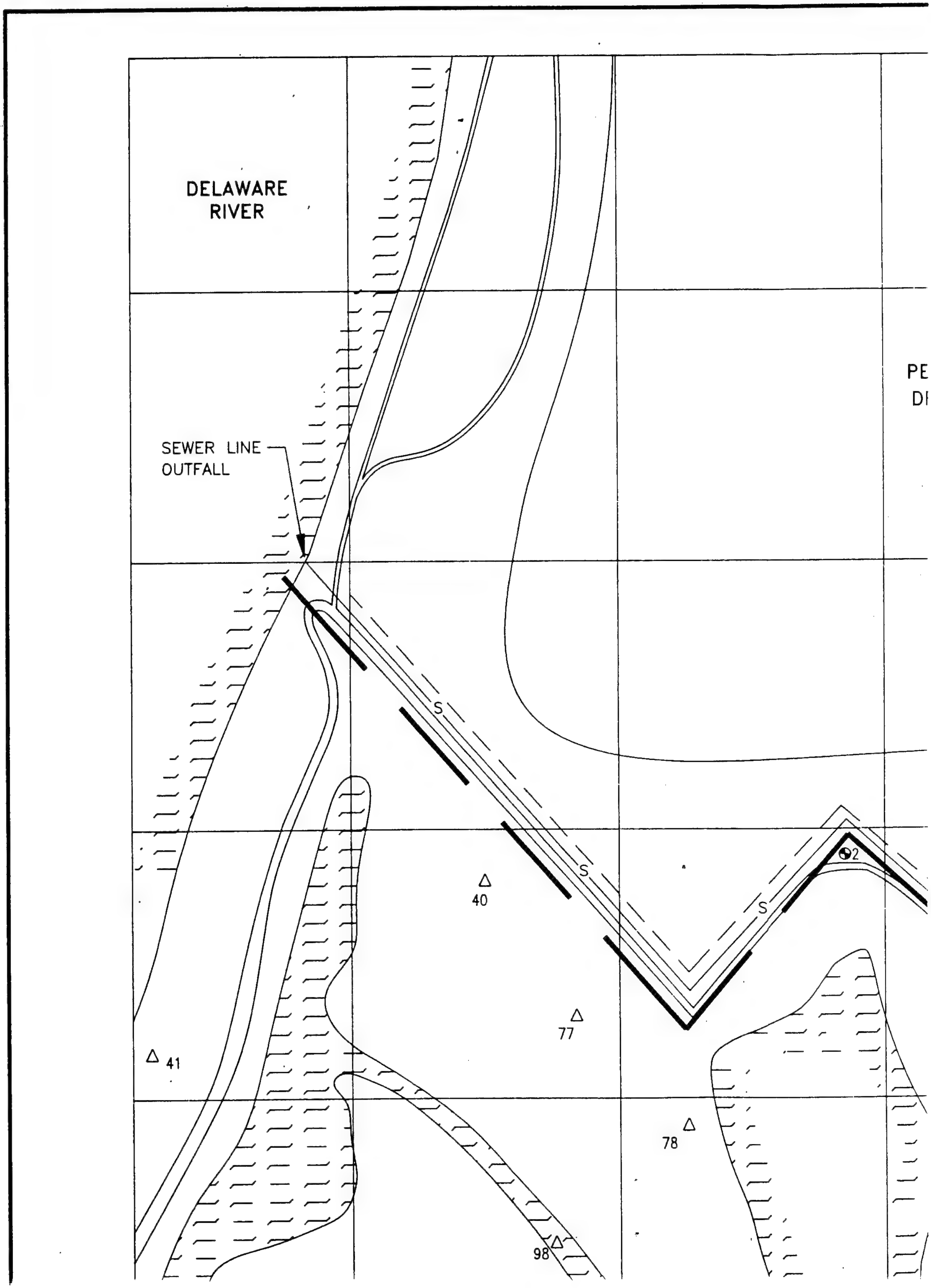
| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | MAXIMUM DETECTED CONCENTRATION (ppm) | AVERAGE CONCENTRATION (ppm) |
|---|---|---|---|---|
| Total petroleum hydrocarbons | 5 /5 | 100 | 3890 | 1851.20 |
| Mercury | 1 /5 | 20 | 0.145 | 0.04 |
| Lead | 5 /5 | 100 | 280 | 117.62 |
| Arsenic | 5 /5 | 100 | 49 | 17.18 |
| Selenium | 3 /5 | 60 | 1.33 | 0.79 |
| Aluminum | 5 /5 | 100 | 8230 | 4904 |
| Iron | 5 /5 | 100 | 270000 | 105296 |
| Magnesium | 5 /5 | 100 | 45000 | 10568 |
| Manganese | 5 /5 | 100 | 1680 | 658.68 |
| Molybdenum | 1 /5 | 20 | 2.93 | 0.99 |
| Nickel | 5 /5 | 100 | 20.5 | 12.67 |
| Potassium | 3 /5 | 60 | 662 | 253.6 |
| Sodium | 4 /5 | 80 | 530 | 231.28 |
| Titanium | 5 /5 | 100 | 251 | 169 |
| Barium | 5 /5 | 100 | 61.2 | 45.84 |
| Cadmium | 4 /5 | 80 | 7 | 3.19 |
| Chromium | 5 /5 | 100 | 34.2 | 17.29 |
| Cobalt | 5 /5 | 100 | 52.8 | 22.64 |
| Copper | 4 /5 | 80 | 82.9 | 30.85 |
| Vanadium | 5 /5 | 100 | 40.1 | 18.89 |
| Zinc | 5 /5 | 100 | 277 | 160.44 |
| Calcium | 5 /5 | 100 | 95000 | 23356 |
| Benzo[b]fluoranthene | 4 /5 | 80 | 6 | 1.72 |
| Fluoranthene | 4 /5 | 80 | 6 | 2.03 |
| Chrysene | 1 /5 | 20 | 2 | 0.69 |

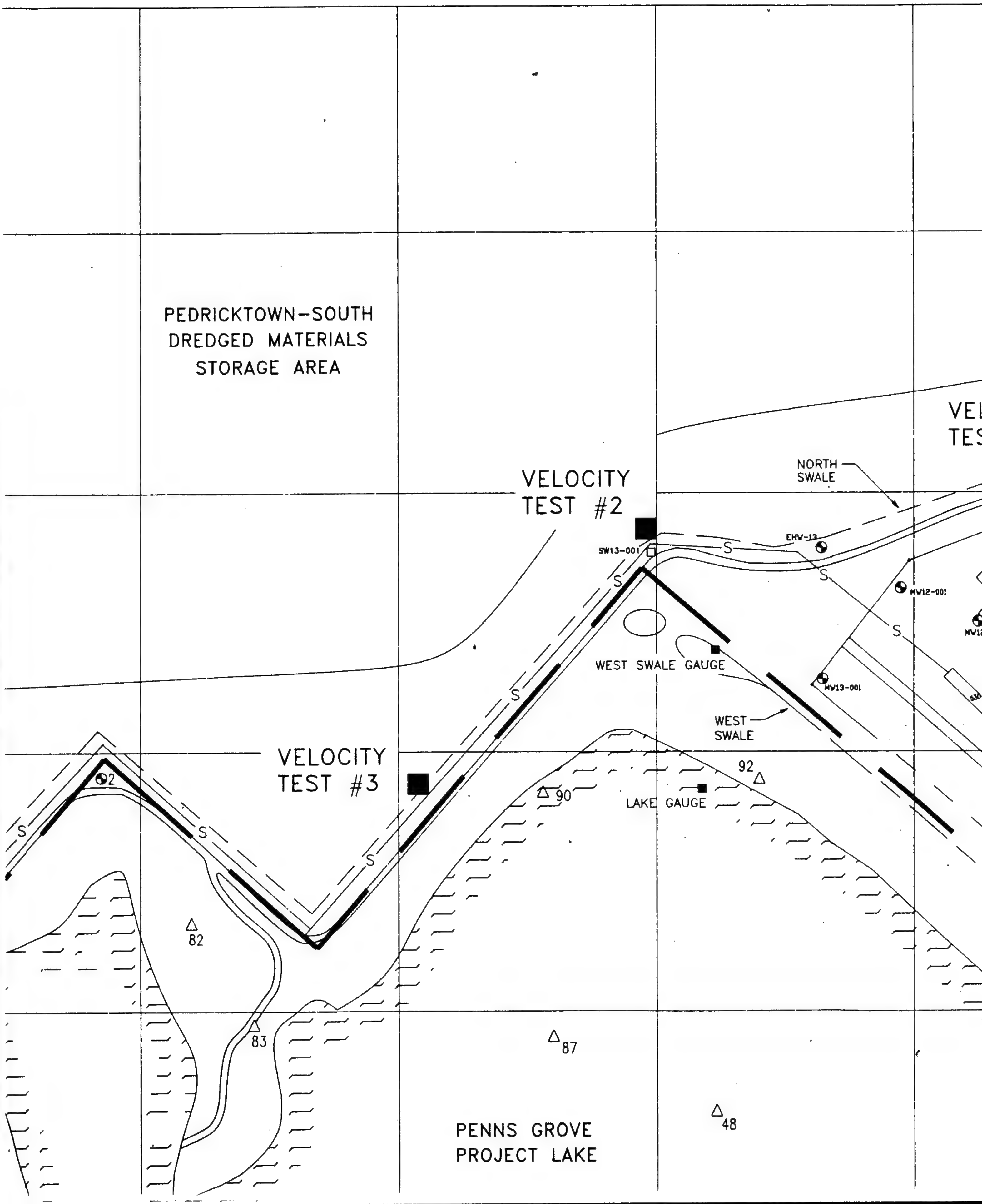
TABLE 3.4 (continued)
STATISTICAL EVALUATION OF SEDIMENT SAMPLES

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | MAXIMUM DETECTED CONCENTRATION (ppm) | AVERAGE CONCENTRATION (ppm) |
|---|---|---|---|---|
| Anthracene | 1 /5 | 20 | 0.7 | 0.19 |
| Pyrene | 4 /5 | 80 | 5 | 1.63 |
| Benzo[a]pyrene | 4 /5 | 80 | 4 | 1.21 |
| Benzo[a]anthracene | 4 /5 | 80 | 2 | 0.72 |
| Acenaphthene | 1 /5 | 20 | 0.3 | 0.11 |
| Phenanthrene | 4 /5 | 80 | 3 | 1.35 |
| Fluorene | 1 /5 | 20 | 0.3 | 0.11 |
| 2-Methylnaphthalene | 1 /5 | 20 | 10 | 2.04 |
| Indeno[1,2,3-C,D]pyrene | 3 /5 | 60 | 2 | 0.57 |
| Ethylbenzene | 1 /5 | 20 | 1.5 | 0.3 |
| Toluene | 2 /5 | 40 | 0.5 | 0.10 |
| Xylenes | 1 /5 | 20 | 5.9 | 1.18 |
| Methylene chloride / Dichloromethane | 1 /5 | 20 | 0.1 | 0.06 |

ppm = parts per million or ug/g
Note: Table includes only those parameters detected above laboratory - certified detection limits.

(1)

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NORTH SWALE
VELOCITY TEST #2
SW13-001
EMW-13
MW12-001
MW12
WEST SWALE GAUGE
MW13-001
WEST SWALE
VELOCITY TEST #3
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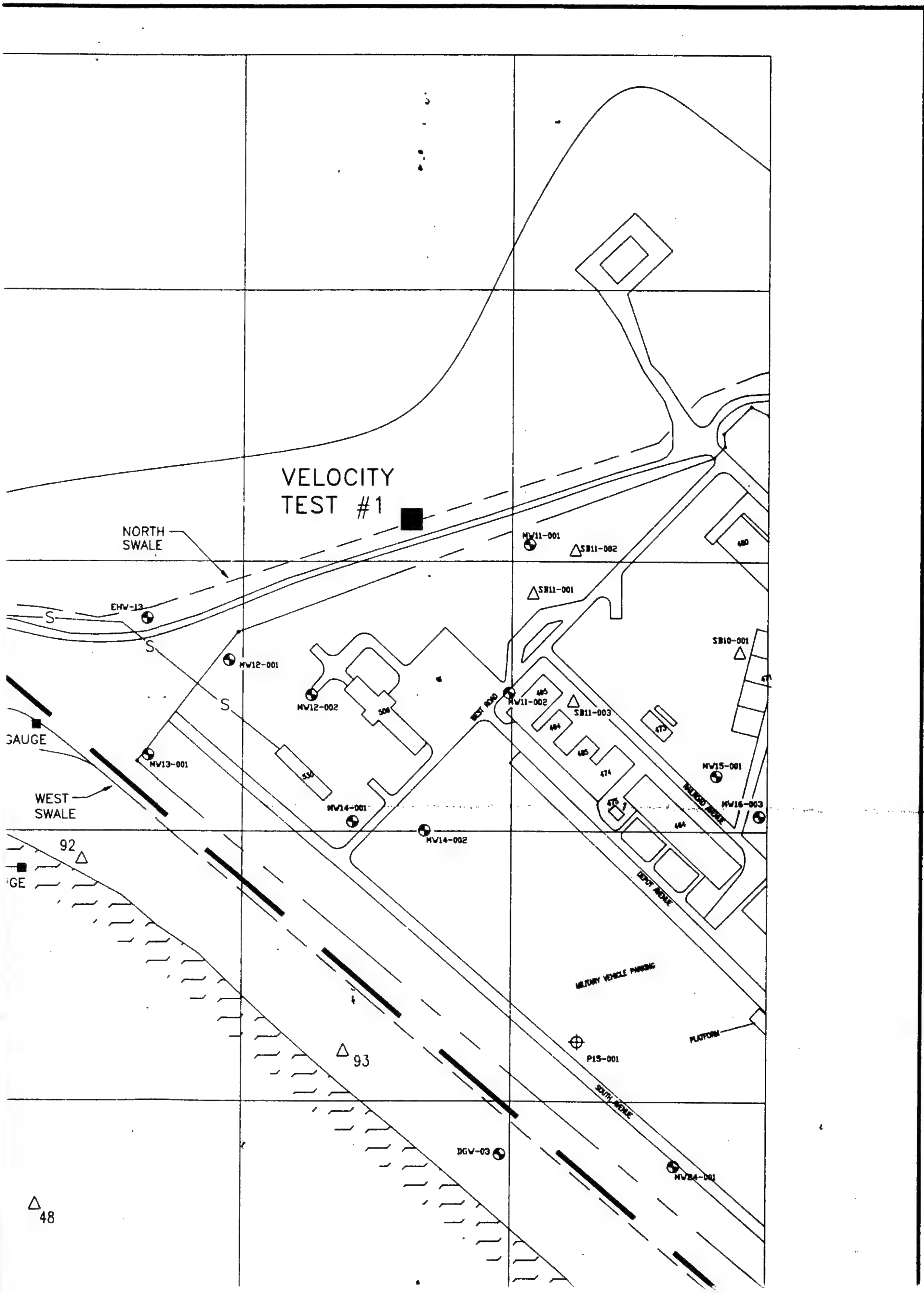
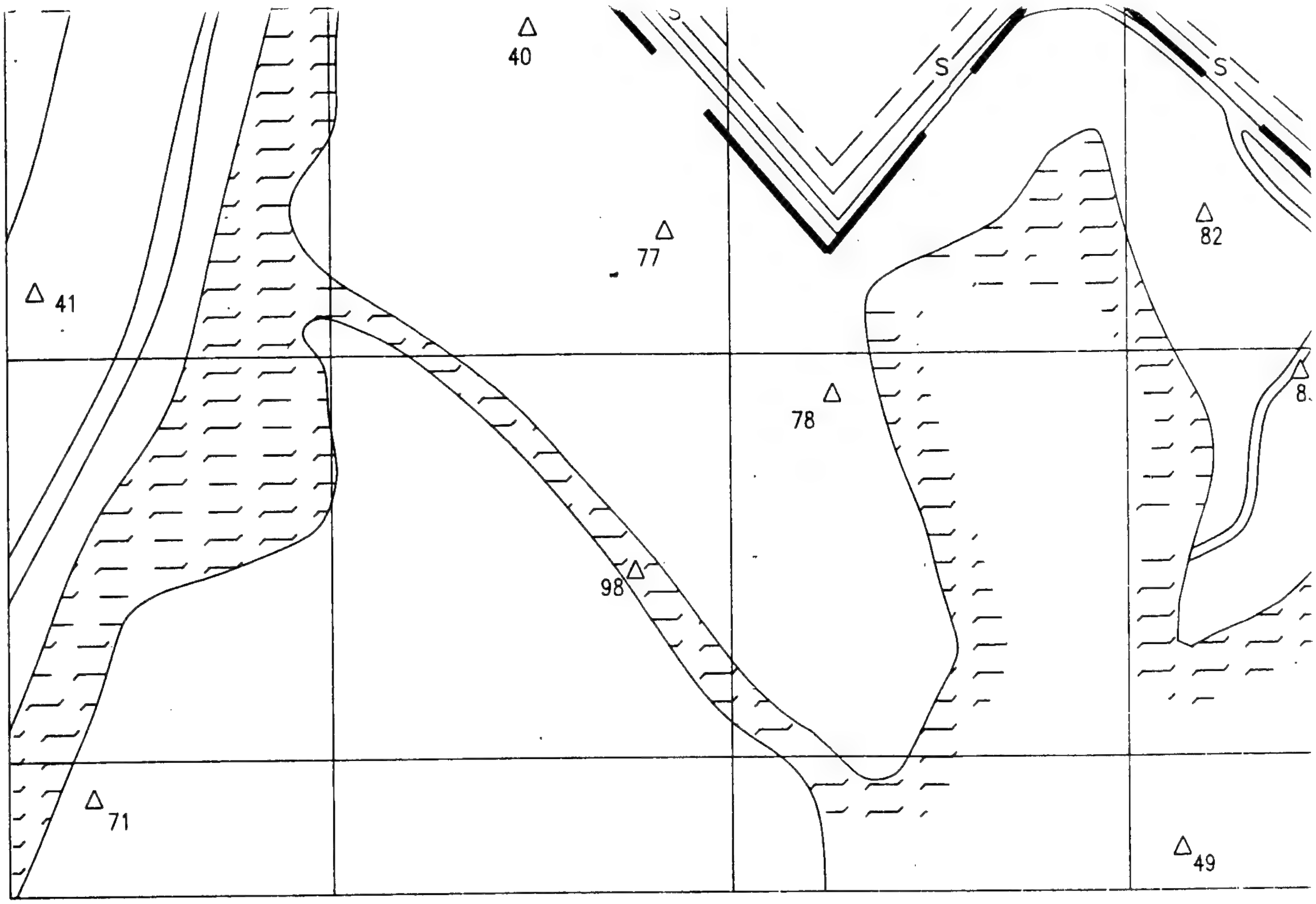
90
LAKE GAUGE
82
83
87
48
PENNS GROVE PROJECT LAKE

3



VELOCITY
TEST #1
NORTH
SWALE
WEST
SWALE
MW11-001
SB11-002
SB11-001
MW12-001
MW12-002
MW13-001
MW14-001
MW14-002
MW11-002
SB11-003
SB10-001
MW15-001
MW16-003
WEST ROAD
RAILROAD AVENUE
DEPOT AVENUE
SOUTH AVENUE
MILITARY VEHICLE PARKING
PLATFORM
P15-001
DGW-03
92
93
48




## KEY

VELOCITY TEST LOCATION

SURFACE WATER SAMPLE LOCATION

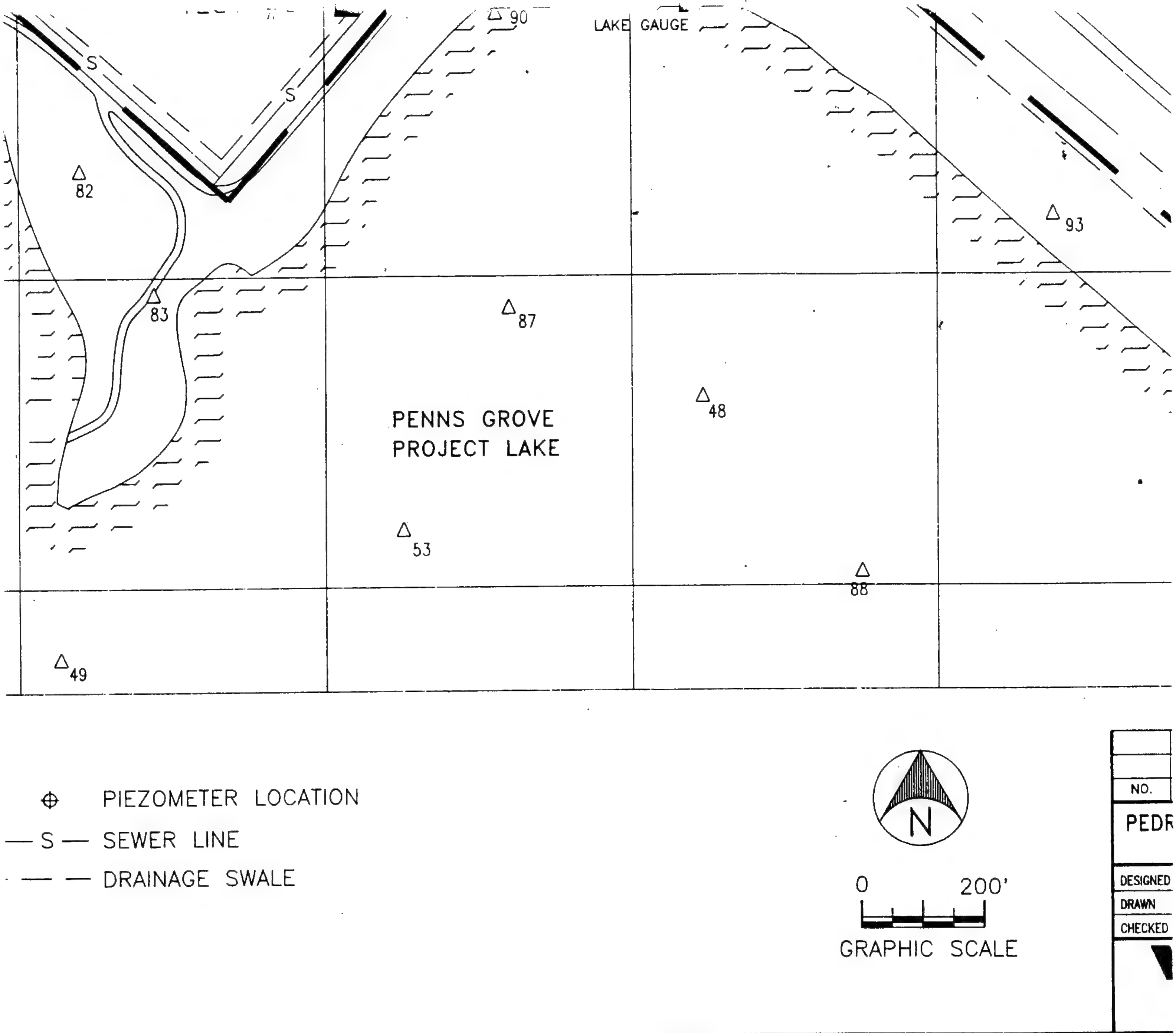
MONITORING WELL LOCATION

SOIL BORING LOCATION

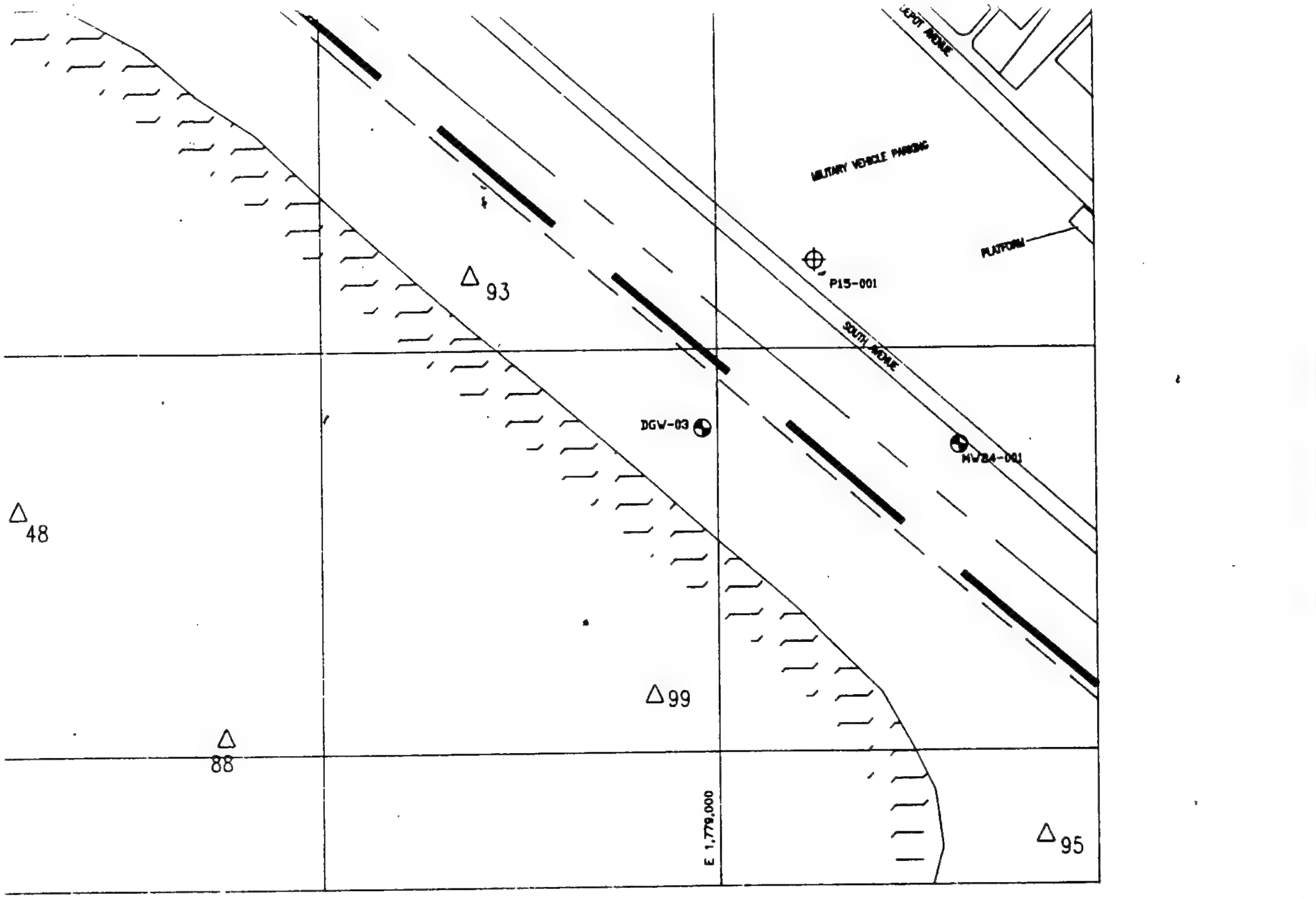
PIEZC

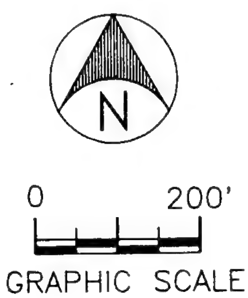
— S — SEWE

— — — DRAIN



LAKE GAUGE
90
S
S
82
83
87
93
48
PENNS GROVE
PROJECT LAKE
53
88
49
PIEZOMETER LOCATION
— S — SEWER LINE
— — DRAINAGE SWALE
N
0
200'
GRAPHIC SCALE
NO.
PEDR
DESIGNED
DRAWN
CHECKED

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**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

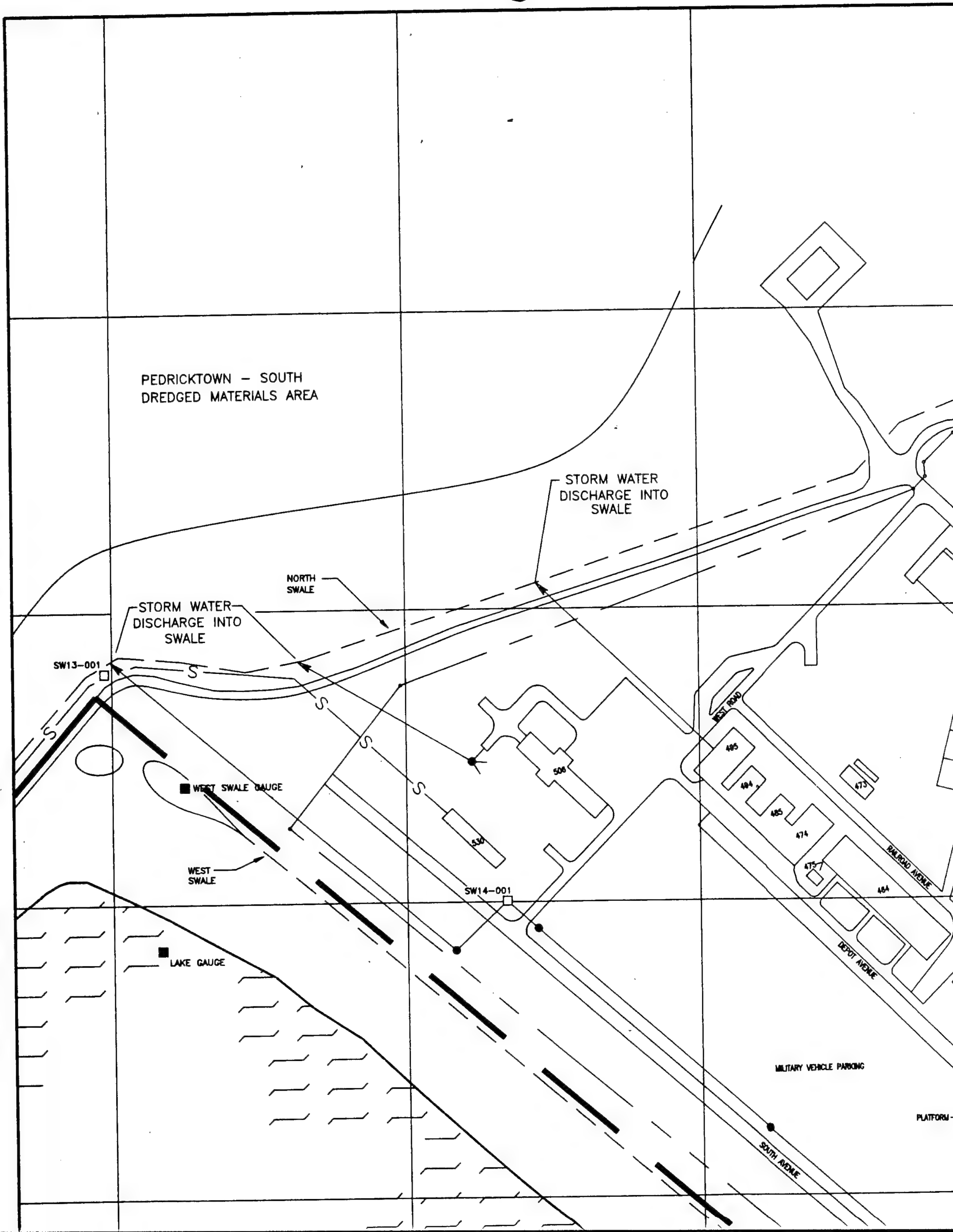
| | | |
|---|---|---|
| DESIGNED | TRANTOW | DATE 09/28/93 |
| DRAWN | KEMLER | 09/30/93 |
| CHECKED | TRANTOW | 10/04/93 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

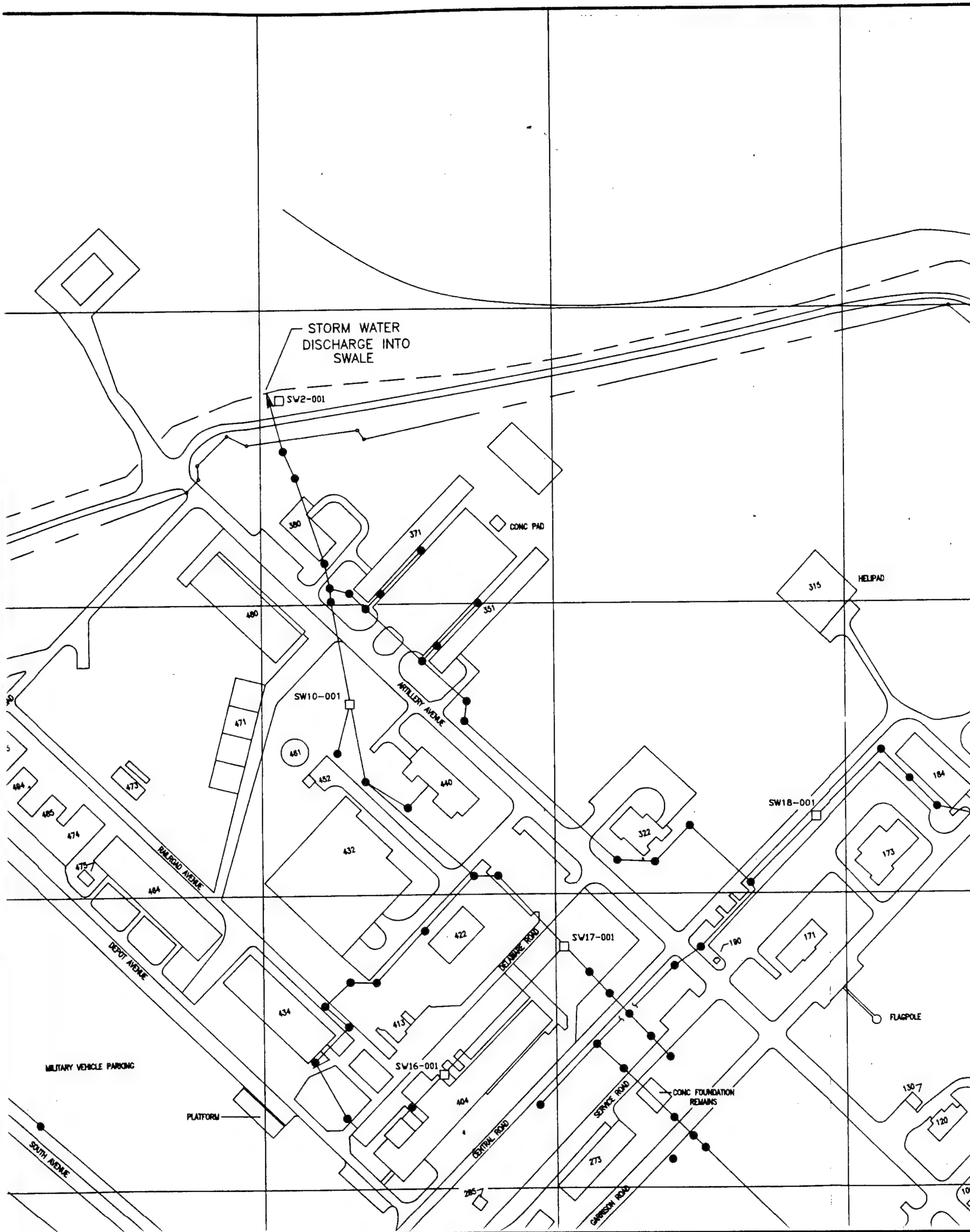
## FIGURE 3.1
SURFACE WATER VELOCITY TEST LOCATION MAP

PROJECT NO. 2060.000 | SCALE NOTED

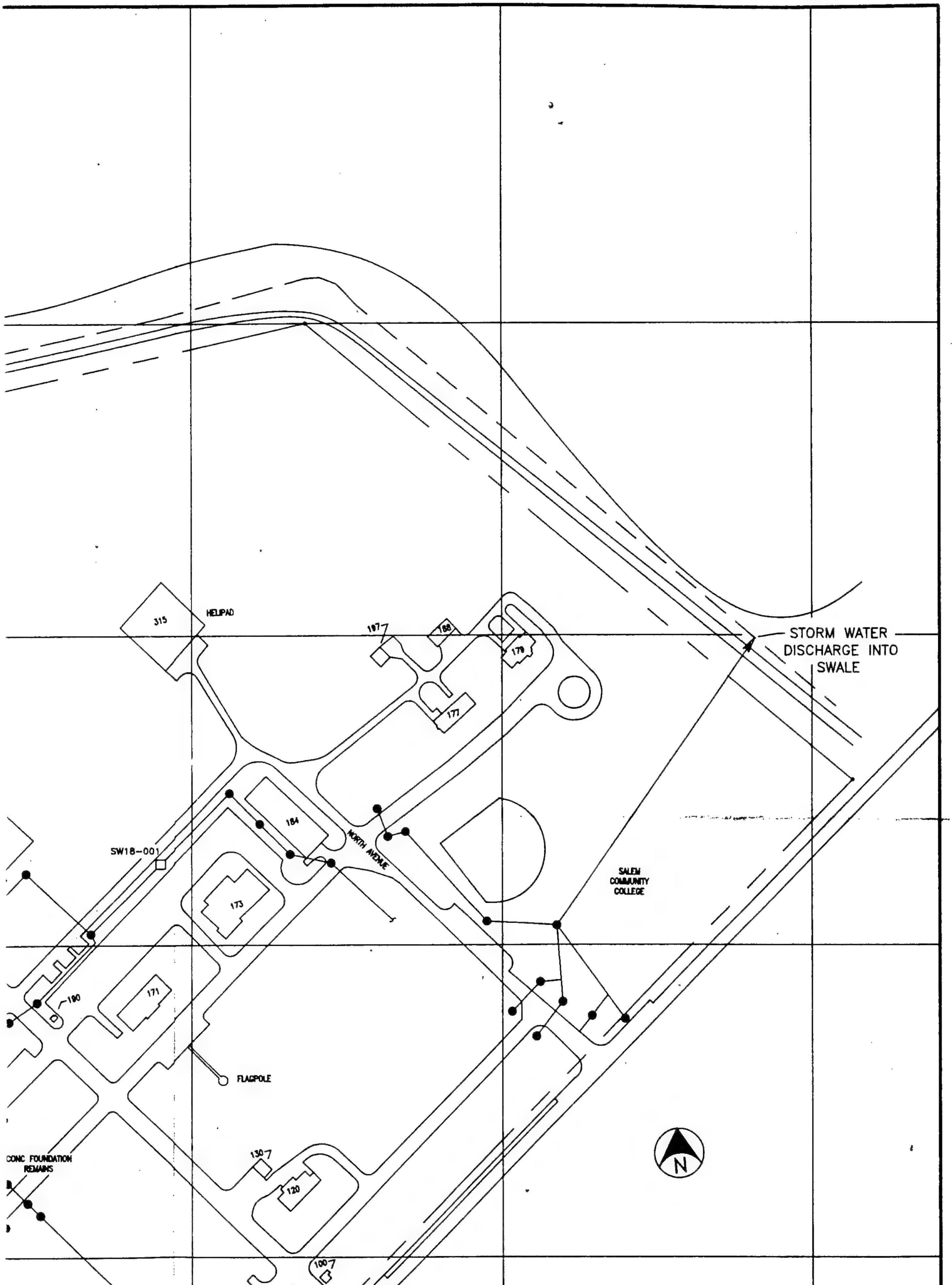
1

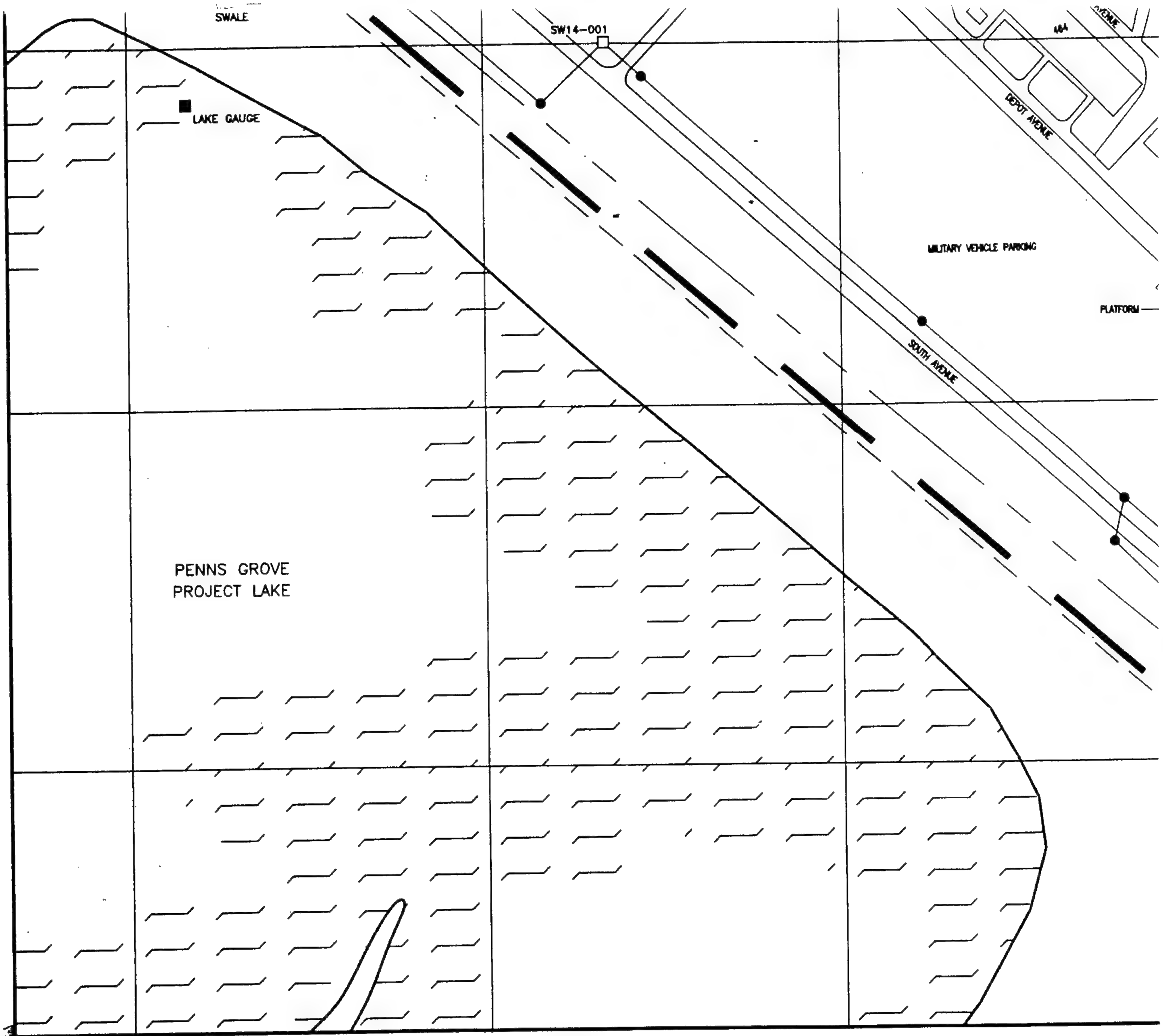

PEDRICKTOWN – SOUTH
DREDGED MATERIALS AREA
STORM WATER
DISCHARGE INTO
SWALE
NORTH
SWALE
STORM WATER
DISCHARGE INTO
SWALE
SW13-001
WEST SWALE GAUGE
WEST
SWALE
LAKE GAUGE
SW14-001
506
530
WEST ROAD
485
494
485
474
473
475
484
RAILROAD AVENUE
DEPOT AVENUE
MILITARY VEHICLE PARKING
PLATFORM
SOUTH AVENUE

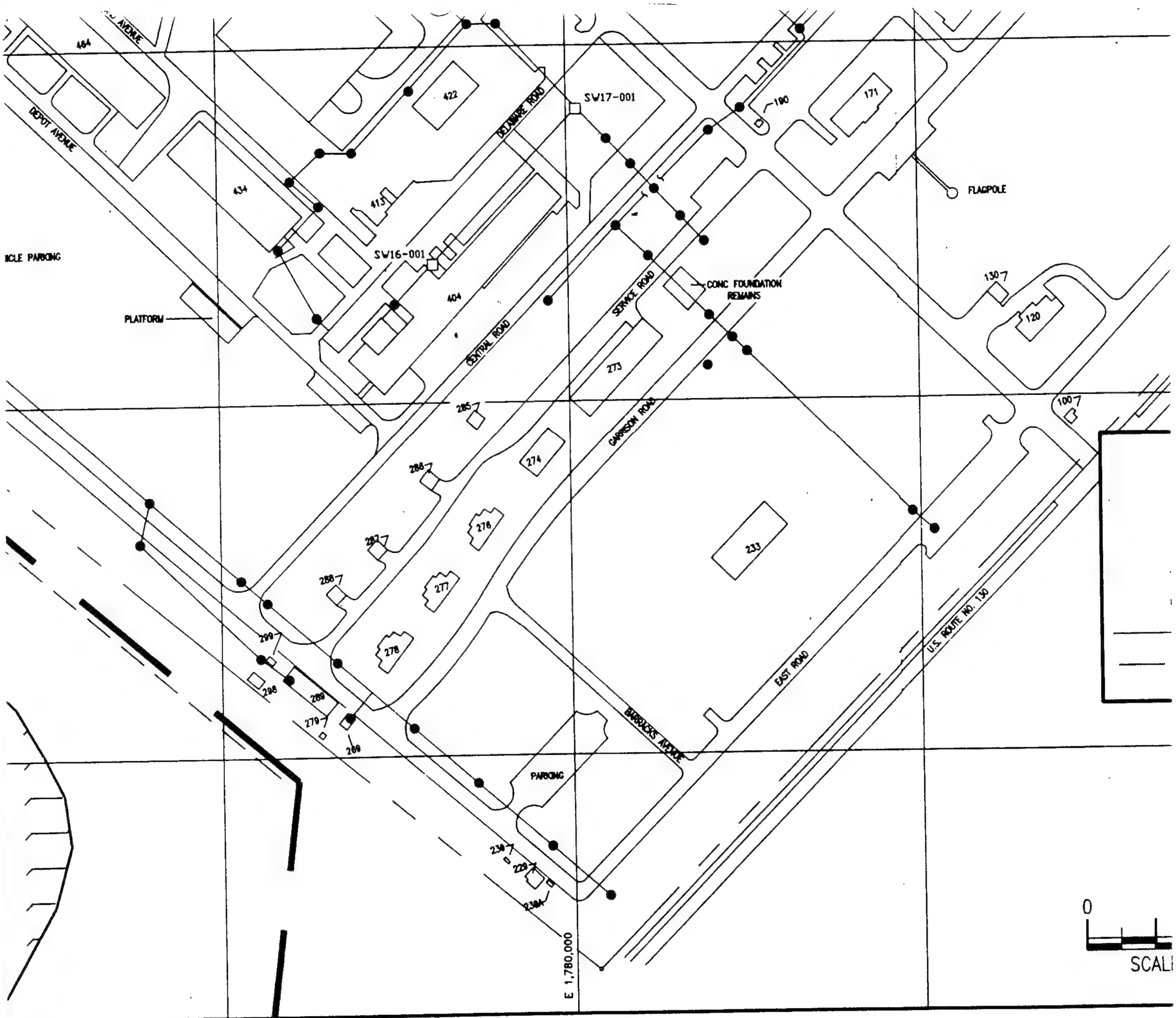
②


STORM WATER DISCHARGE INTO SWALE
SW2-001
380
371
CONC PAD
480
351
315
HELIPAD
SW10-001
ARTILLERY AVENUE
471
461
473
452
440
484
485
474
475
RAILROAD AVENUE
484
432
322
SW18-001
184
173
422
DELAWARE ROAD
SW17-001
190
171
DEPOT AVENUE
434
413
FLAGPOLE
MILITARY VEHICLE PARKING
SW16-001
CONC FOUNDATION REMAINS
404
SERVICE ROAD
130
PLATFORM
120
CENTRAL ROAD
273
SOUTH AVENUE
285
GARRISON ROAD
100

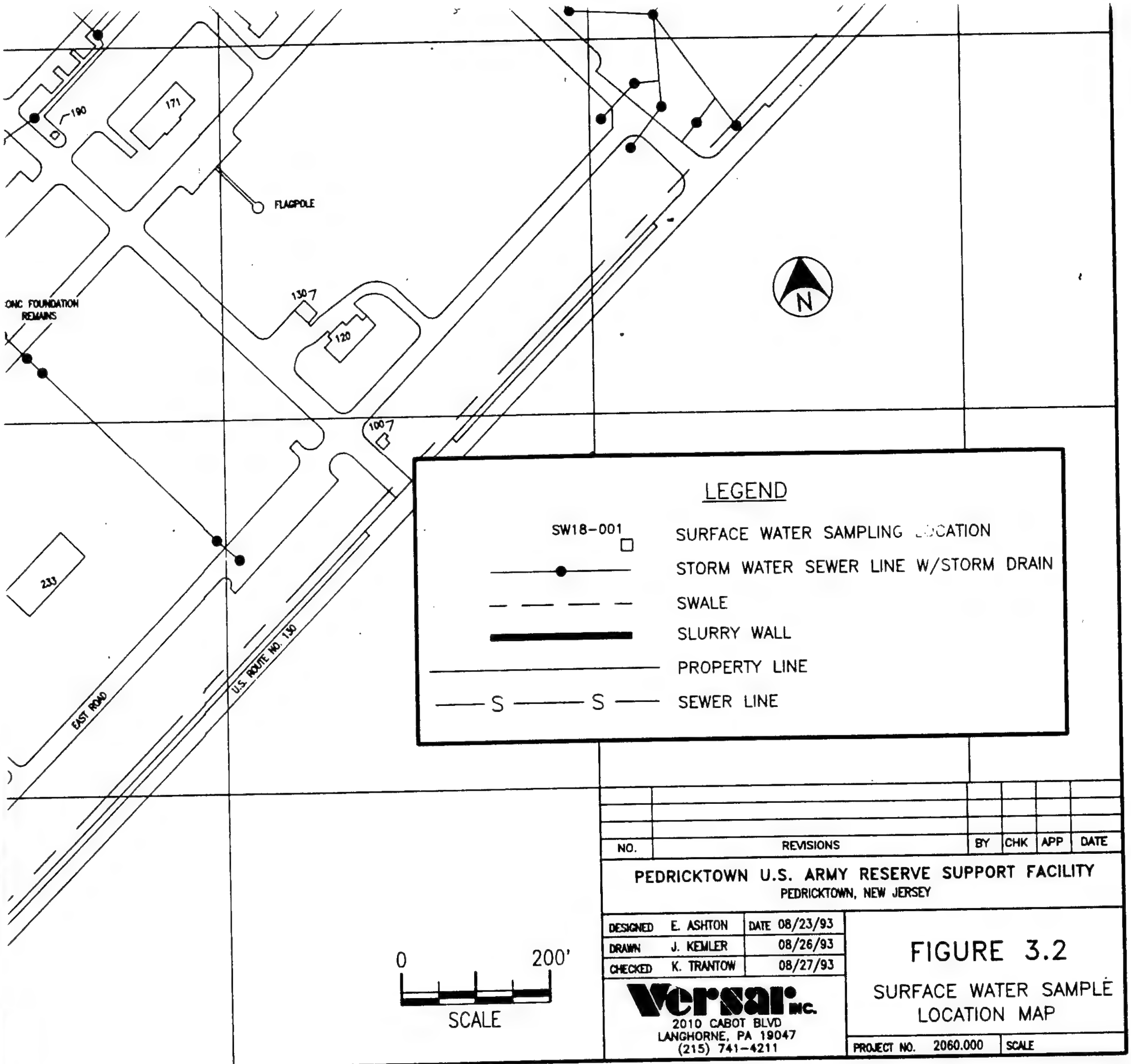
3


315
HELIPAD
187
188
179
177
184
NORTH AVENUE
SW18-001
173
171
190
FLAGPOLE
CONC FOUNDATION REMAINS
130
120
100
STORM WATER DISCHARGE INTO SWALE
SALEM COMMUNITY COLLEGE
N


SWALE
SW14-001
LAKE GAUGE
MILITARY VEHICLE PARKING
PLATFORM
DEPOT AVENUE
SOUTH AVENUE
PENNS GROVE
PROJECT LAKE


SW17-001
SW16-001
FLAGPOLE
CONC FOUNDATION REMAINS
PLATFORM
PARKING
DEPOT AVENUE
DELAWARE ROAD
CENTRAL ROAD
SERVICE ROAD
GARRISON ROAD
BARRACKS AVENUE
EAST ROAD
U.S. ROUTE NO. 130
E 1,780,000
SCAL

5


190
171
FLAGPOLE
CONC FOUNDATION REMAINS
130
120
100
233
EAST ROAD
U.S. ROUTE NO. 130
LEGEND
SW18-001
SURFACE WATER SAMPLING LOCATION
STORM WATER SEWER LINE W/STORM DRAIN
SWALE
SLURRY WALL
PROPERTY LINE
S S
SEWER LINE
0 200'
SCALE
NO.
REVISIONS
BY
CHK
APP
DATE
PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY
DESIGNED E. ASHTON DATE 08/23/93
DRAWN J. KEMLER 08/26/93
CHECKED K. TRANTOW 08/27/93
Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211
FIGURE 3.2
SURFACE WATER SAMPLE LOCATION MAP
PROJECT NO. 2060.000
SCALE

## 4.0 SOIL MATERIALS

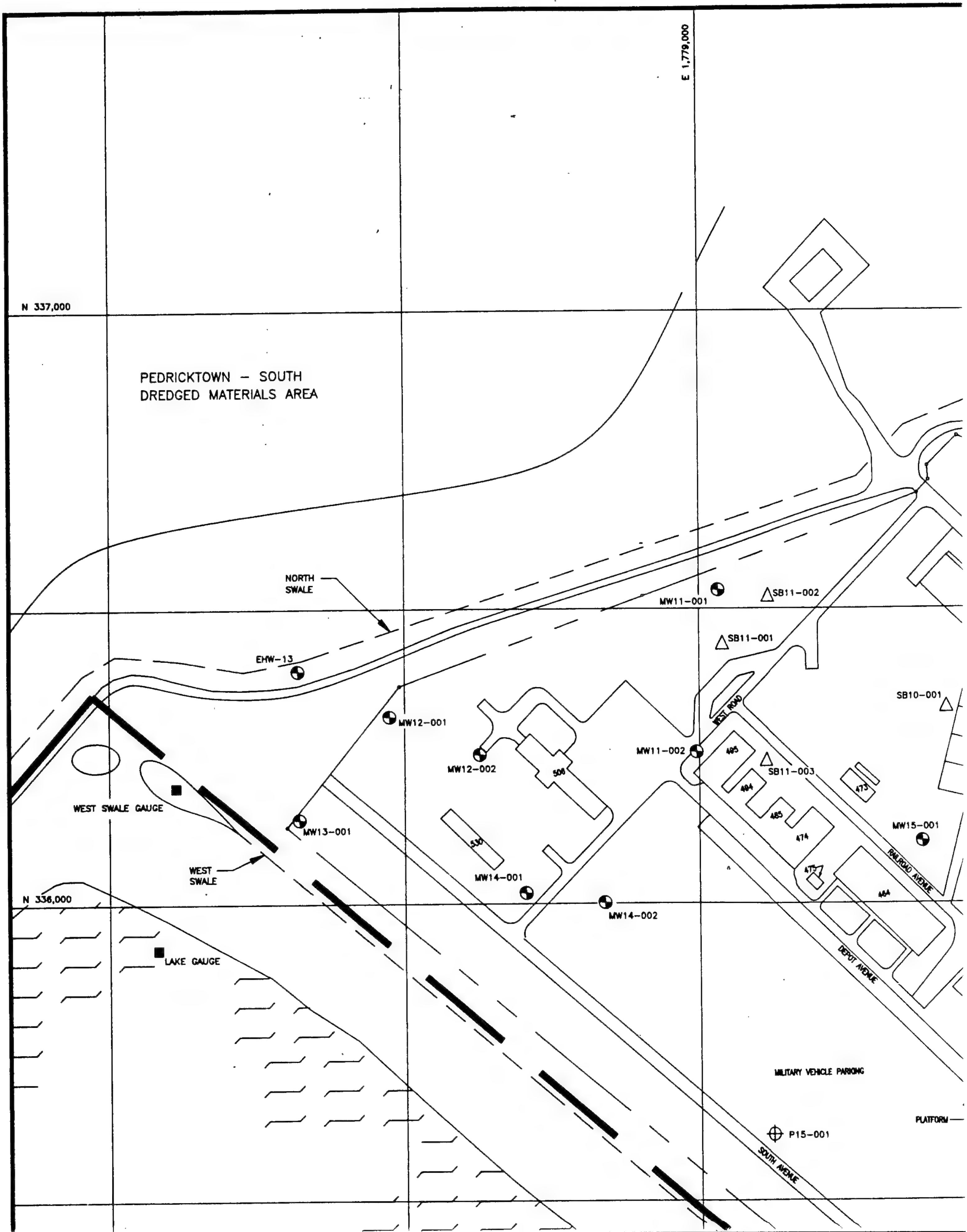
Drilling activities were performed by Versar and JCA of Marlton, New Jersey, from June 1 to 11, 1993. Prior to drilling, all underground utilities were located by the site engineer. To expedite the drilling efforts, borings were advanced with two separate drill rigs, utilizing hollow-stem auger techniques. Borings were approximately located as originally outlined in the ESI Project Plan. Borings located within the area of the unexploded ordnance survey were moved slightly, as discussed in detail in Section 7.4 of this report. A total of 27 borings were drilled on-site, of which 19 were converted to monitoring wells and 3 into piezometers. The remaining 5 borings were backfilled with bentonite until flush with the ground surface. Figure 4.1 depicts the borehole/monitoring well locations at PSF.

Versar geologists documented soil descriptions utilizing the USCS classifications, photoionization detector (PID) readings, depth to groundwater encountered, and any further observations on the borehole lithologic logs (Appendix B). Investigation derived wastes (IDW), such as the auger cuttings from each boring, were temporarily stored on-site in 55-gallon DOT-approved drums, pending final disposition (Appendix A, Photograph 8).

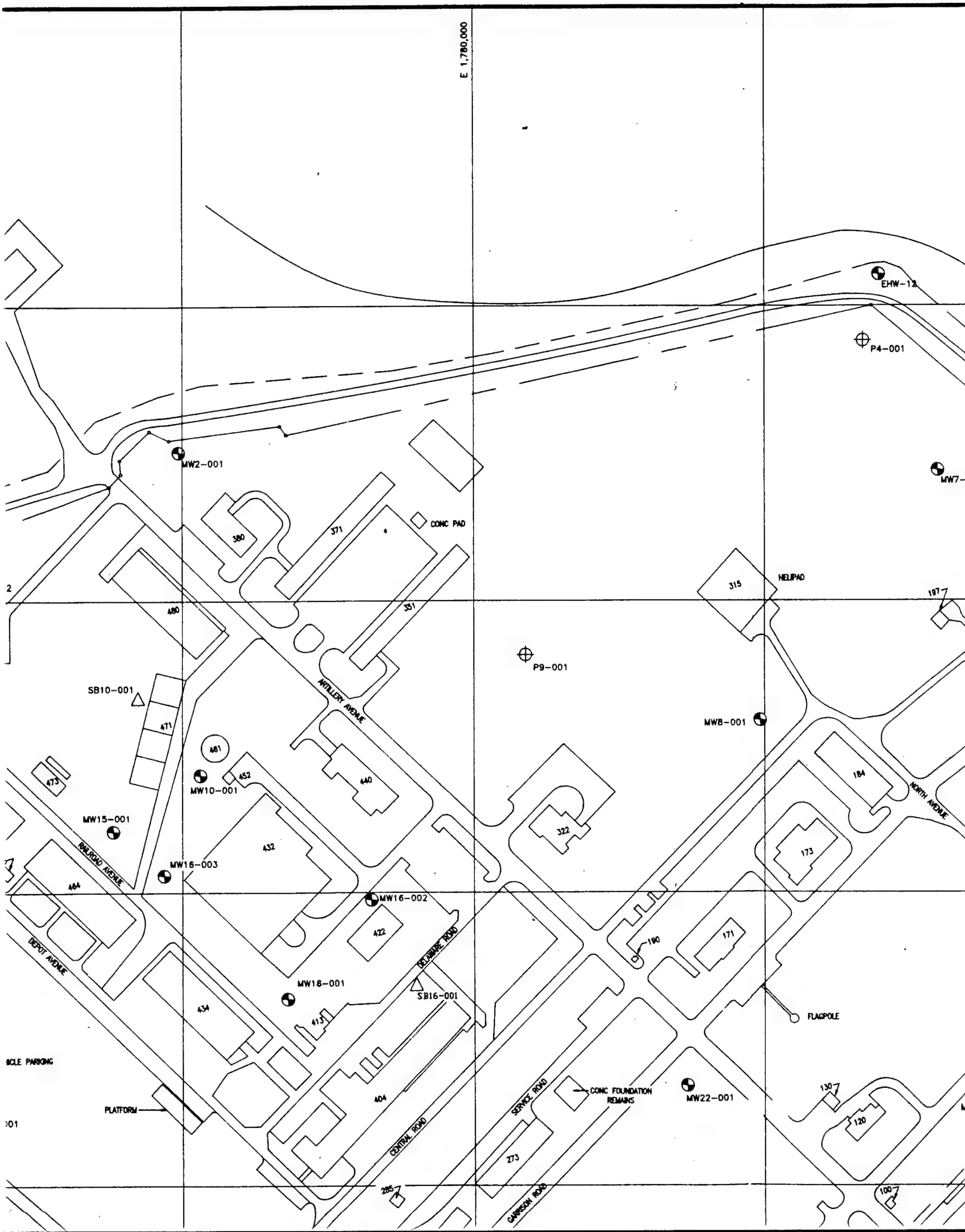
Soil samples were collected continuously in each boring until saturated soils were encountered. Borings for the piezometers were sampled beyond the saturation level at 5-foot intervals, for lithologic description purposes only. Surface soil samples were collected from a depth interval of 0-2 feet bgs. Subsurface soil samples were collected below them, but above or at the soil/water interface. Total depths of the borings ranged from 4-36 feet bgs. Soil samples were submitted for quantitative analysis of VOCs, SVOCs, inorganics, TPHCs, and explosive parameters (explosives at selected locations only), following strict chain-of-custody procedures. Chemical analysis was completed by USAEC-certified ESE laboratories in Gainesville, Florida, and Denver, Colorado. Collection, documentation, preservation and shipping of samples followed the protocol outlined in the ESI Project Plan and QAPP.

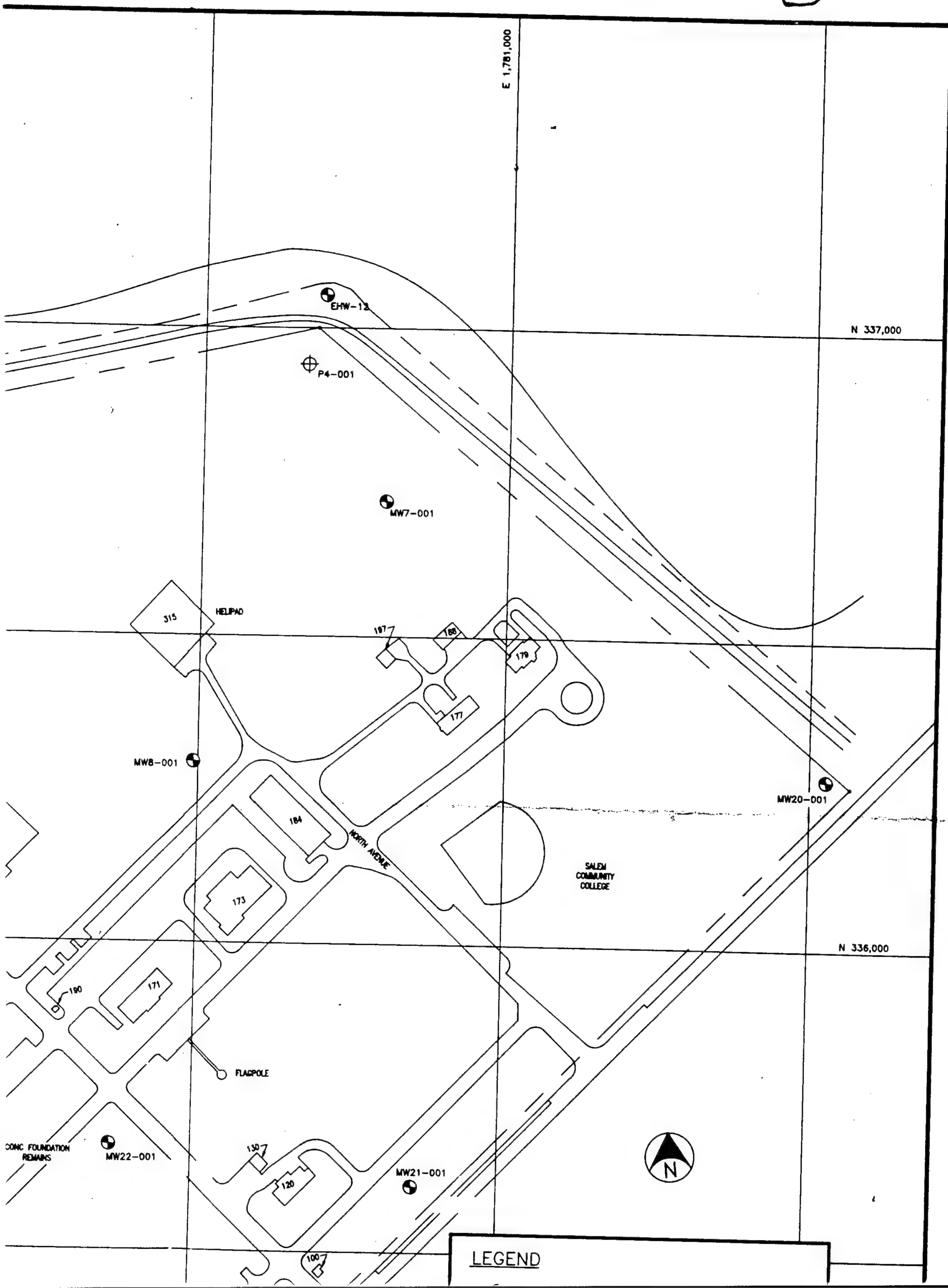
Soil samples were qualitatively screened to assess concentrations of organic compounds. This screening incorporated a PID, model MW-101, manufactured by HNu Systems, Inc. fitted with an 11.7 electron-volt (eV) lamp. Calibration of the PID was accomplished each day, using 100 ppm isobutylene gas. Along with the PID screening, samples were also visually and olfactorily inspected for hydrocarbon staining, odors, sheen and iridescence.

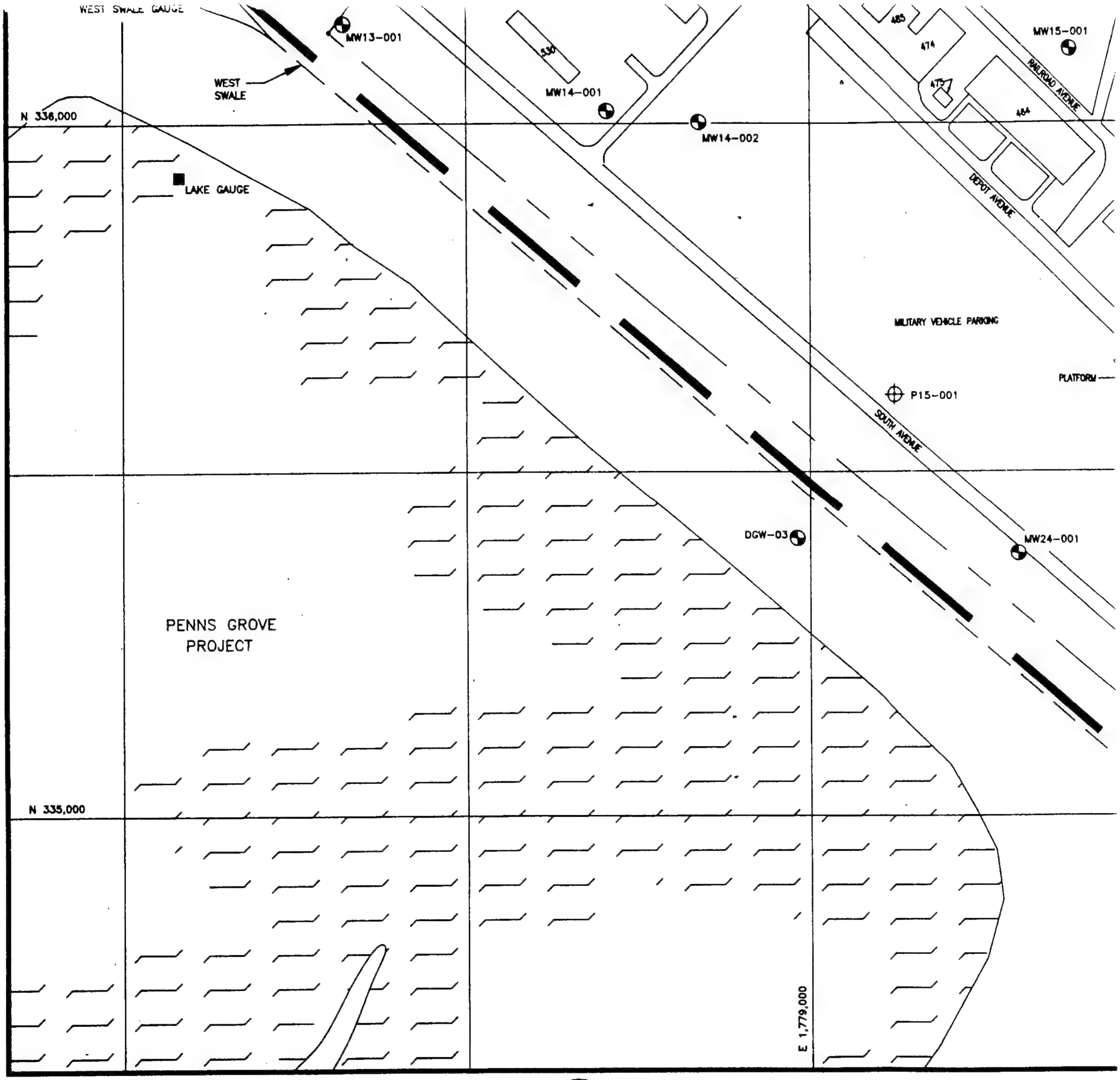
(1)


E 1,779,000
N 337,000
PEDRICKTOWN – SOUTH
DREDGED MATERIALS AREA
NORTH
SWALE
MW11-001
SB11-002
SB11-001
EHW-13
SB10-001
MW12-001
WEST ROAD
MW11-002
495
SB11-003
MW12-002
506
494
473
WEST SWALE GAUGE
MW13-001
485
474
MW15-001
530
RAILROAD AVENUE
WEST
SWALE
MW14-001
475
484
N 336,000
MW14-002
LAKE GAUGE
DEPOT AVENUE
MILITARY VEHICLE PARKING
PLATFORM
P15-001
SOUTH AVENUE

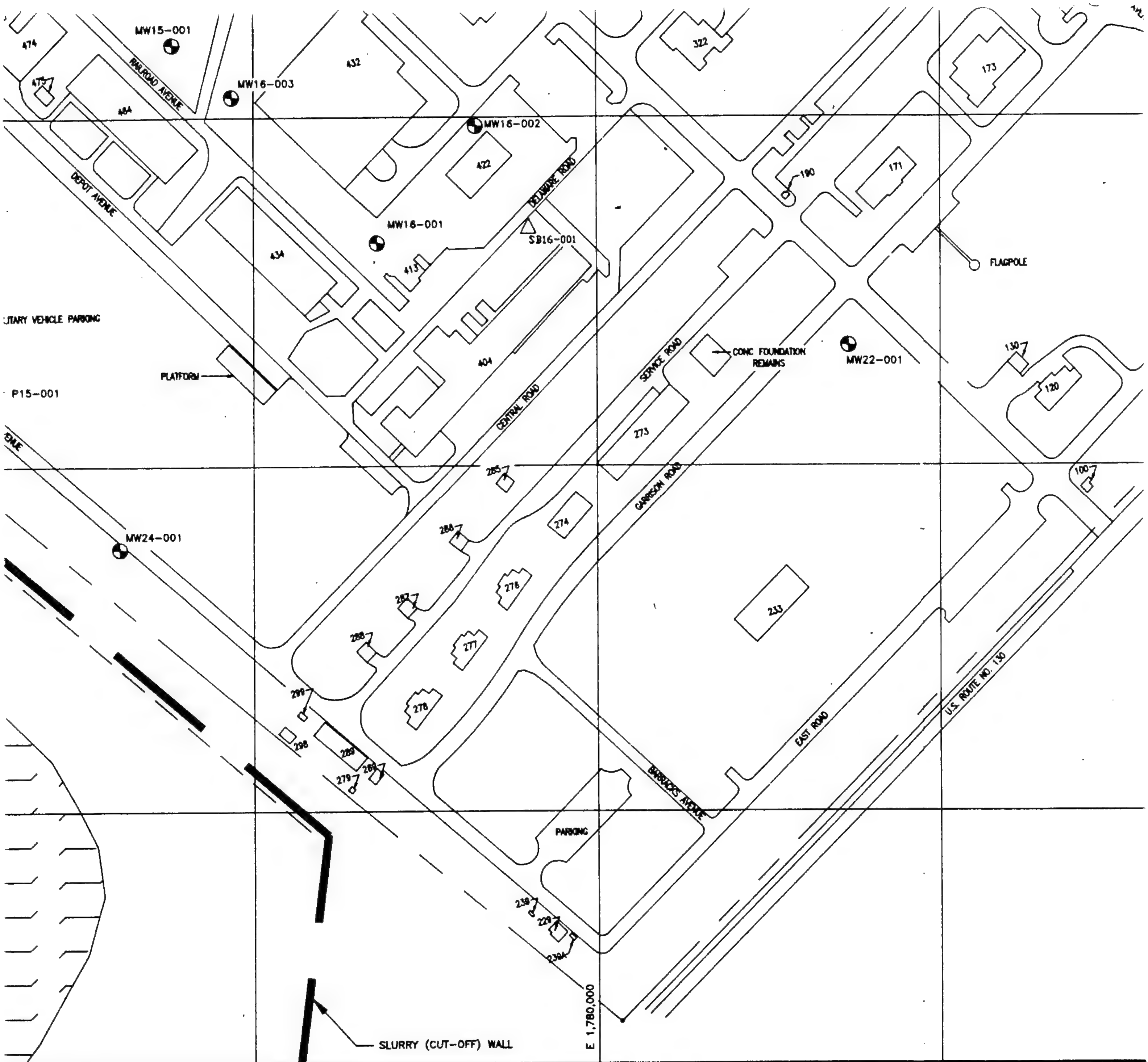
(a)


E 1,780,000
EHW-12
P4-001
MW2-001
MW7-
CONC PAD
380
371
351
480
315
HELIPAD
197
P9-001
SB10-001
471
ARTILLERY AVENUE
MW8-001
481
473
MW10-001
452
440
184
NORTH AVENUE
MW15-001
432
322
173
RAILROAD AVENUE
MW16-003
484
MW16-002
422
190
171
DEPOT AVENUE
DELAWARE ROAD
MW18-001
SB16-001
434
413
FLAGPOLE
CLE PARKING
404
SERVICE ROAD
CONC FOUNDATION REMAINS
MW22-001
130
PLATFORM
120
CENTRAL ROAD
273
285
GARRISON ROAD
100

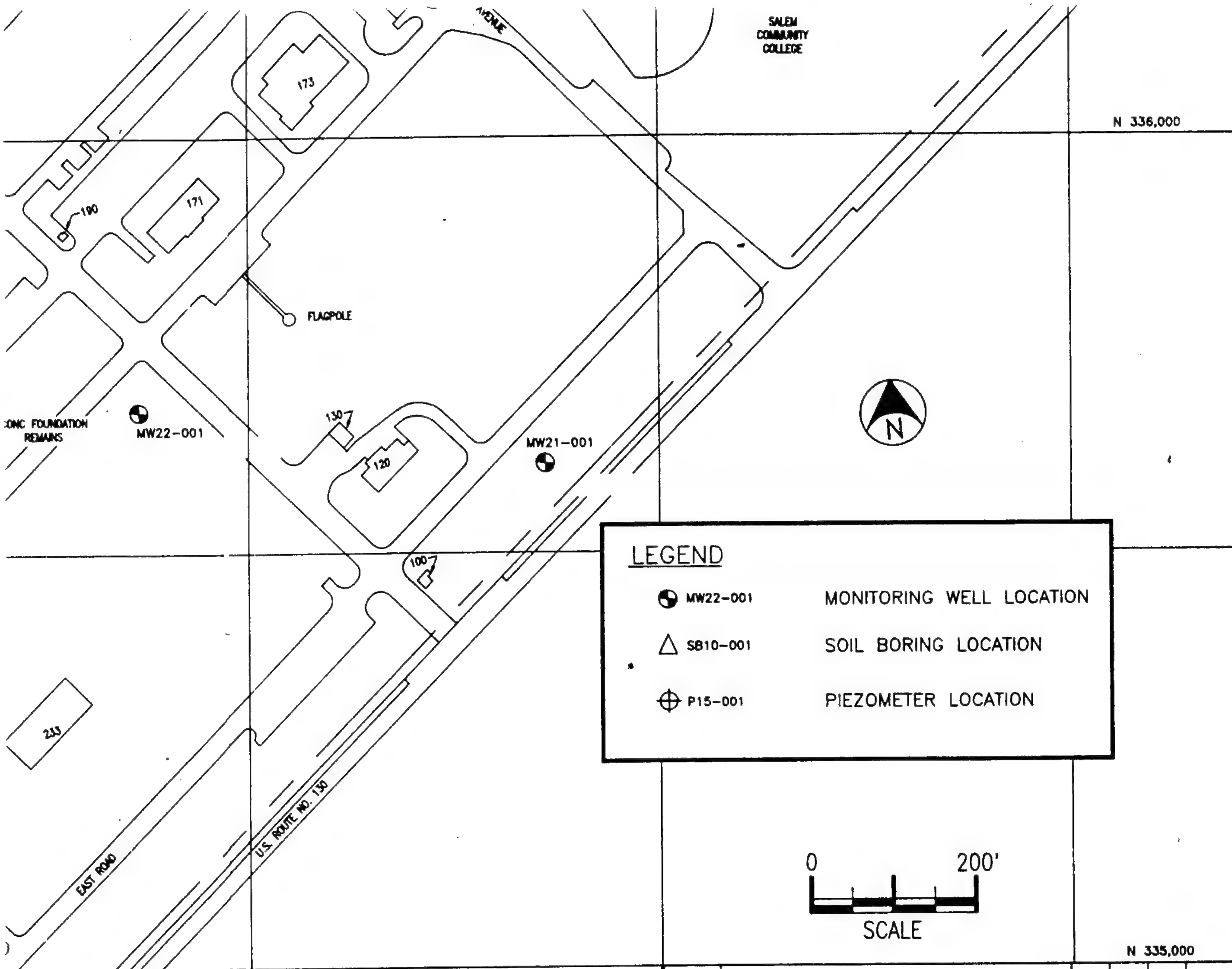

E 1,781,000
N 337,000
N 336,000
EHW-12
P4-001
MW7-001
315
HELIPAD
197
188
179
177
MW8-001
184
NORTH AVENUE
MW20-001
SALEM COMMUNITY COLLEGE
173
171
190
FLAGPOLE
CONC FOUNDATION REMAINS
MW22-001
130
120
MW21-001
100
N
LEGEND


WEST SWALE GAUGE
MW13-001
WEST SWALE
530
MW14-001
MW14-002
485
474
475
484
MW15-001
RAILROAD AVENUE
DEPOT AVENUE
N 336,000
LAKE GAUGE
MILITARY VEHICLE PARKING
PLATFORM
P15-001
SOUTH AVENUE
DGW-03
MW24-001
PENNS GROVE PROJECT
N 335,000
E 1,779,000

4



MW15-001
MW16-003
MW16-002
MW16-001
SB16-001
MW22-001
MW24-001
P15-001
RAILROAD AVENUE
DEPOT AVENUE
DELAWARE ROAD
CENTRAL ROAD
SERVICE ROAD
GARRISON ROAD
EAST ROAD
BARRACKS AVENUE
U.S. ROUTE NO. 130
FLAGPOLE
CONC FOUNDATION REMAINS
PLATFORM
PARKING
SLURRY (CUT-OFF) WALL
E 1,780,000

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**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | E. ASHTON | DATE 08/23/93 |
| DRAWN | J. KEMLER | 08/26/93 |
| CHECKED | K. TRANTOW | 08/27/93 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

FIGURE 4.1
BOREHOLE/MONITORING WELL LOCATION MAP

PROJECT NO. 2060.000 SCALE

6

All sampling equipment was decontaminated prior to sample collection, following procedures outlined in the ESI Project Plan and QAPP. The augers and drill stems were steam-cleaned using a high pressure, high temperature, water jet. Steam-cleaning took place in the designated decon containment area, and the water generated during these activities was contained on-site in 55-gallon DOT-approved drums, pending final disposal.

Soil sampling activities were conducted in order to assess potential impacts to surface and subsurface soils located proximate to potential areas of concern. Twenty-seven subsurface soil samples were collected from depths ranging from 2-6 feet. Surface soil samples were collected at intervals of 0-2 foot bgs from 22 locations.

## 4.1 Subsurface Soil Quality

### 4.1.1 Background Quality of Subsurface Soil

Due to the natural variability of soils and regional influences on soil conditions, background soil conditions were established to determine if site-related activities have had an impact on soils. Three soil borings were installed along the east-southeast border of the PSF property to assess subsurface soil background quality. The borings were located upgradient of all areas of potential concern. Five background subsurface soil samples were collected, 3 from the 2-4 foot interval and 2 from the 4-6 foot below grade interval. The samples were analyzed for VOCs, SVOCs, inorganic compounds, TPHCs, and explosive compounds.

Eighteen inorganic compounds were detected in at least one of the background samples, including: lead (5 out of 5), arsenic (4 out of 5), selenium (1 out of 5), aluminum (5 out of 5), iron (5 out of 5), magnesium (5 out of 5), manganese (4 out of 5), nickel (4 out of 5), potassium (4 out of 5), sodium (5 out of 5), titanium (5 out of 5), barium (5 out of 5), chromium (5 out of 5), cobalt (5 out of 5), copper (4 out of 5), vanadium (5 out of 5), zinc (5 out of 5), and calcium (5 out of 5). Toluene, the only organic compound detected, was found in only one sample. No explosive compounds were detected in the background soil samples.

In order to form a baseline for comparison between background samples and site-related subsurface soil conditions, the average concentrations of the background samples were established for each compound detected in at least one site-related subsurface soil sample. One half the detection limit was used for all sampling results that were reported to be less than the detection limit. A

summary of background sampling results and calculated average background concentrations for subsurface soils is presented in Table 4.1.

### 4.1.2 Inorganic Compounds in Subsurface Soil

Subsurface soil sampling results indicate 22 inorganic compounds have been detected on-site. Lead, arsenic, aluminum, iron, magnesium, manganese, nickel, potassium, sodium, titanium, barium, chromium, cobalt, copper, vanadium, zinc, and calcium were detected in 100% of the subsurface soil samples. Selenium was detected in 12 samples, molybdenum in 3 samples, beryllium in 2 samples, and mercury and silver in 1 sample. Thallium and cadmium were not detected. Summaries of subsurface soil sampling results and a statistical analysis of the data are presented in Tables 4.2 and 4.3, respectively.

### 4.1.3 Organic Compounds in Subsurface Soil

Ten SVOCs and two VOCs were detected in a limited number of on-site subsurface soil samples. The following SVOCs were detected: fluoranthene (1 out of 22), benzo[b]fluoranthene (2 out of 22), bis(2-ethylhexyl)phthalate (1 out of 22), pyrene (2 out of 22), benzo[a]pyrene (2 out of 22), benzo[a]anthracene (1 out of 22), benzoic acid (1 out of 22), di-n-butyl phthalate (3 out of 22), phenanthrene (2 out of 22), and indeno[1,2,3-C,D]pyrene (1 out of 22). VOCs detected included toluene in one sample and acetone in 8 samples. Subsurface soil sampling results are summarized in Table 4.2 and statistical data for each compound are summarized in Table 4.3.

### 4.1.4 Explosive Compounds in Subsurface Soil

The analysis of subsurface soils for explosive compounds indicated that all parameters were below laboratory detection limits.

### 4.1.5 Subsurface Soil Data Comparison

In order to determine if chemical concentrations are attributable to site-related activities, each compound detected in at least one sample was compared to 2 times the average background concentration. The Hazard Ranking System (HRS, *Federal Register* Volume 55, No. 241, December 14, 1990) recommends the comparison of data to 3 times background in order to determine if a release has occurred. For the purposes of this evaluation, sample results were compared to 2 times background as a more conservative estimate. Compounds that were determined to be in excess of 2 times background were further evaluated with respect to regulatory requirements. Specifically, compound concentrations were compared with NJDEPE's *Proposed Cleanup Standards for Contaminated Sites* (N.J.A.C. 7:26D),

proposed February 3, 1992, and revised March 8, 1993. These standards have not been promulgated, but represent the NJDEPE's recommended guidance. The NJDEPE soil standards include criteria for residential direct contact, non-residential direct contact, and impact to groundwater. Direct contact standards apply to surface soils (i.e., 0-2 feet) and impact to groundwater standards apply to subsurface soils (i.e., >2 feet). Subsurface soils were compared with standards for impact to groundwater. In cases where compounds detected in subsurface soils are not highly mobile, no impact to groundwater standards have been developed; in these instances, the non-residential direct contact standards, although not strictly applicable, were considered. Although the site could potentially be used completely for residential use in the future, direct contact with subsurface soils is not a likely exposure scenario for on-site residents. Table 4.4 provides a summary of sampling locations exceeding twice background and the NJDEPE proposed standards.

The following compounds were detected in subsurface soils at concentrations that exceeded two times background: TPHCs, mercury, lead, arsenic, selenium, aluminum, magnesium, manganese, molybdenum, nickel, potassium, silver, sodium, barium, beryllium, chromium, copper, vanadium, zinc, calcium, benzo[b]fluoranthene, fluoranthene, bis(2-ethylhexyl)phthalate, pyrene, benzo[a]pyrene, benzo[a]anthracene, phenanthrene, indeno[1,2,3-C,D]pyrene, benzoic acid, di-n-butyl phthalate, and acetone. None of these compounds exceeded NJDEPE cleanup criteria. The greater concentrations of arsenic detected were in sample locations MW10-001, MW12-001, MW12-002, MW13-001, MW16-002, MW16-003, and SB11-001. Since these sampling locations are not proximate to one another, no clear contaminant distribution pattern can be identified. MW12-001, MW12-002, and MW13-001 are all located in the vicinity of the former leaching ponds and downgradient of the former scrap metal storage area. Although no compounds exceeded NJDEPE cleanup criteria, contaminant concentrations in MW12-001 were generally highest, indicating that the former leaching fields and/or scrap metal storage area may have had a minimal impact on subsurface soils.

### 4.1.6 Potential Subsurface Soil Transport Pathways

The primary contaminant transport pathway available for subsurface soils is the leaching of contaminants from soils to groundwater. Contaminants found in the soils on-site consist mainly of metals and PAHs.

The metals, or inorganic compounds, which were detected in the soils at PSF rarely occur merely as ions, but are present as hydroxides, oxides, salts, and

complexes with organic molecules. The chemical and physical properties of the different salts and complexes can vary widely. The transport of inorganic materials from soil to groundwater depends on many factors as each inorganic compound behaves differently in the environment. The ability of each to enter groundwater depends on its individual oxidation state, the cationic exchange capacity of the soils, its ability to sorb to entrained solids, its solubility, the pH of its environment, its ability to complex with soluble low molecular weight soil organic matter components (e.g., fulvic or humic acids, [Kerndorf and Schnitzer, 1980]), aerobic or anaerobic environments, adsorption-desorption processes, and/or the presence or absence of other contributing compounds (e.g., the presence of calcium elevates pH, favoring adsorption of cadmium, [EPA, 1979]). In general, mobility of heavy metals is much less than that of other compounds of concern (e.g., VOCs and SVOCs), and is expected to be minimal at PSF.

Because background levels of inorganics in both soil and groundwater at the site were elevated, it is more difficult to evaluate the soil to groundwater pathway. Inorganics detected in the subsurface soils on-site above 2 times background levels included: mercury, lead, arsenic, selenium, aluminum, magnesium, manganese, molybdenum, nickel, potassium, silver, sodium, barium, beryllium, chromium, copper, vanadium, zinc, and calcium. The only metals found in the groundwater in excess of 2 times background that also exceeded NJDEPE cleanup standards, were the following: lead, arsenic, antimony, cadmium, and chromium. However, background concentrations also exceeded the NJDEPE criteria for each of these compounds (except chromium), suggesting that they may not be site-related. These concentrations of metals may be indicative of regional background conditions. No concentrations of lead in the surface or subsurface soil on-site were above NJDEPE criteria for this metal. Concentrations of lead in the groundwater exceeded NJDEPE criteria in 2 locations down-gradient of the motor pool and may be correlated with associated operations. Concentrations of arsenic found in the groundwater at PSF in excess of 2 times background and NJDEPE criteria were located in wells EHW-12 and MW7-001. These wells are cross- or up-gradient from elevated concentrations of arsenic in the surface and subsurface soils on-site and therefore, their location does not support a migration pathway from soil to groundwater. Antimony and cadmium were not found above detection limits in the subsurface soil, therefore their presence in groundwater does not support a migration pathway from subsurface soil to groundwater.

NJDEPE has no soil standards for chromium. Because the elevated chromium concentration in groundwater was detected in a different area than elevated chromium concentrations in soil, no correlations can be drawn between these media. Only one subsurface soil sample and 4 surface soil samples exceeded the 2 times background level for chromium at PSF. These samples were generally collected in the vicinity of the former scrap metal storage area. Only one groundwater sample contained chromium which exceeded NJDEPE criteria for this metal (100 ppb). This sample was collected from MW16-002, located just north of Building 422, which was used previously for the Nike Missile Command Center. Because previous operations in this vicinity are classified, no correlation can be made as to the prior operations and the presence of elevated chromium. No significant trends or migration pathways could be determined from the available inorganic data. Most elevated concentrations of metals at PSF were found to be concentrated in the vicinity of the former scrap metal storage area.

PAHs have varying volatilities, soil binding characteristics, and water solubilities (Gibson, 1984). PAHs with high water solubility and low tendency to adsorb to soils (e.g., low molecular weight compounds such as naphthalene, acenaphthylene, and fluorene) tend to be more mobile in the environment than PAHs that are of higher molecular weight, with a greater number of ring structures (e.g., chrysene and benzo[a]pyrene). The PAHs detected in the soils at PSF are mostly those with higher molecular weights, and therefore are not considered highly mobile in the environment. No PAHs were detected in the groundwater samples collected at the site. This indicates no migration of PAHs from the soil to the groundwater has occurred.

Because the PAH and heavy metal compounds detected in subsurface soils at PSF are not highly mobile and tend to bind to soils, this transport pathway is anticipated to be minimal.

## 4.2 Surface Soil Quality

### 4.2.1 Background Quality of Surface Soil

Background surface soil conditions were established to determine whether site-related activities have had an impact on surface soil quality. Three surface soil samples were collected at 0-2 feet below grade from the background soil boring locations described in Section 4.1.1 and analyzed for VOCs, SVOCs, inorganic compounds, TPHCs, and explosive compounds.

The background surface soil sampling results indicate that 19 inorganic compounds, TPHCs, and 7 SVOCs were detected in at least one background sample. All other compounds were below laboratory detection limits. The following inorganic compounds were detected at the indicated frequency: mercury (1 out of 3), lead (3 out of 3), thallium (1 out of 3), arsenic (3 out of 3), aluminum (3 out of 3), iron (3 out of 3), magnesium (3 out of 3), manganese (3 out of 3), nickel (3 out of 3), potassium (2 out of 3), sodium (3 out of 3), titanium (3 out of 3), barium (3 out of 3), chromium (3 out of 3), cobalt (3 out of 3), copper (3 out of 3), vanadium (3 out of 3), zinc (3 out of 3), and calcium (3 out of 3). TPHCs were detected in 2 of the 3 samples. SVOCs detected include: benzo-[b]fluoranthene (2 out of 3), fluoranthene (1 out of 3), pyrene(2 out of 3), benzo[a]pyrene (2 out of 3), benzo[a]anthracene (1 out of 3), phenanthrene (2 out of 3), and indeno[1,2,3-C,D]pyrene (1 out of 3).

The average concentration of the background samples was calculated for each compound that was detected in at least one site-related surface soil sample to facilitate comparison between site-related activities and background conditions. One half the detection limit was used for all sampling results that were reported to be less than the detection limit. A summary of background sampling results and calculated average background concentrations for surface soils is presented in Table 4.5.

#### 4.2.2 Inorganic Compounds in Surface Soil

Twenty-four inorganic compounds were detected in on-site surface soil samples. Of these, the following 16 compounds were detected in 100 percent of the samples: lead, arsenic, aluminum, iron, magnesium, manganese, potassium, sodium, titanium, barium, chromium, cobalt, copper, vanadium, zinc, and calcium. Compounds detected at a lesser frequency include: nickel (18 out of 19), selenium (13 out of 19), mercury (7 out of 19), molybdenum (6 out of 19), cadmium and silver (4 out of 19), and thallium and beryllium (1 out of 19). Surface soil sampling results are presented in Table 4.6. A summary of the frequency and percentage detected and the average and maximum concentrations for each parameter is presented in Table 4.7.

#### 4.2.3 Organic Compounds in Surface Soil

A total of 17 SVOCs, 4 VOCs, and TPHCs were detected in on-site surface soil samples. SVOCs detected include: benzo[b]fluoranthene (15 out of 19), fluoranthene (10 out of 19), benzo[k]fluoranthene (1 out 19), acenaphthylene (2 out of 19), chrysene (3 out of 19), anthracene (5 out of 19), pyrene (14 out of

19), dibenzofuran (2 out of 19), benzo[a]pyrene (14 out of 19), dibenz-[ah]anthracene (1 out of 19), benzo[a]anthracene (11 out of 19), benzoic acid (2 out of 19), di-n-butyl phthalate (2 out of 19), phenanthrene (13 out of 19), naphthalene (5 out of 19), 2-methylnapthalene (6 out of 19), and indeno[1,2,3-C,D]pyrene (11 out of 19). Of the volatile organic compounds, toluene was detected in 6 samples, acetone in 3, trichlorofluoromethane in 1, and methylene chloride in 5. TPHCs were detected in 10 of the surface soil samples. A summary of surface soil sampling results is presented in Table 4.6 and statistical data is provided in Table 4.7.

### 4.2.4 Explosive Compounds in Surface Soil

No explosive compounds were found in excess of laboratory detection limits.

### 4.2.5 Surface Soil Data Comparison

Surface soil concentrations were compared to 2 times average background concentrations to determine if chemical concentrations are attributable to site-related activities. The HRS recommends the comparison of data to 3 times background in order to determine if a release has occurred. For the purposes of this evaluation, sample results were compared to 2 times background as a more conservative estimate. Compounds that were determined to be in excess of 2 times background were further compared with the NJDEPE's *Proposed Cleanup Standards for Contaminated Sites* (N.J.A.C. 7:26D). The NJDEPE soil standards include criteria for residential direct contact, non-residential direct contact, and impact to groundwater. Although PSF is considered a non-residential site, the site may be used for residential purposes in the future. Therefore, surface soil concentrations were compared to the residential direct contact standards. Due to the high groundwater table at the site, the impact to groundwater standards were applied if more stringent than the direct contact standards. Table 4.8 provides a summary of sampling locations exceeding twice background and the NJDEPE proposed standards.

The only compound detected in surface soils that was not detected in excess of two times background in at least one sample was thallium. However, the only compounds that exceeded the NJDEPE direct contact cleanup standards were arsenic, cadmium, copper, and benzo[b]fluoranthene. Cadmium exceeded direct contact cleanup criteria in MW11-001, MW12-002, MW13-001, and SB11-001. Copper exceeded direct contact cleanup criteria in sample location SB11-001 only, however, this concentration does meet compliance criteria as documented in N.J.A.C. 7:26D-3.3(b)2., *Cleanup Standards for Contaminated Sites*, February 3, 1992. Benzo-

[b]fluoranthene slightly exceeded cleanup criteria in sample location SB11-003. Arsenic exceeded the cleanup standard in MW12-001, SB11-001 and SB11-003. Detectable arsenic concentrations were generally found in the same areas in surface and subsurface soils. A review of surface soil data points that exceed cleanup criteria indicates that SB11-001 consistently exceeded cleanup standards for inorganic compounds. This result is not surprising because SB11-001 was installed to evaluate potential impacts from the former scrap metal storage area. Surface soil sampling results indicate that the former scrap metal storage area and other downgradient areas may have been impacted by site-related activities.

#### 4.2.6 Potential Surface Soil Transport Pathways

Potential transport pathways for on-site surface soils include migration to the subsurface soils and ultimately to the groundwater, and overland runoff to the storm drains and sediments. Detectable concentrations of arsenic were also found in subsurface soils and sediments collected in the vicinity of the former scrap metal storage area and the leaching ponds, indicating that this pathway is complete.

### 4.3 Geotechnical Analysis

Along with the soil sampled for chemical analysis at each soil boring location, soil samples were taken for geotechnical analysis at various intervals, in an attempt to collect a sample from each representative soil horizon. Empire Soils Investigations, Inc., Division of Huntingdon, in Middleport, New York, completed the geotechnical analyses on a total of 27 samples, including: grain size distribution, plastic limit testing, liquid limit testing, and final description of each using USCS (ASTM D2487) classifications. Appendix G contains the geotechnical testing report.

The results of the geotechnical analysis revealed that all of the samples submitted fell into USCS categories SP, SP-SM, or SM. These categories indicate sand with little gravel and trace fines (SP), or sand with some fines and trace gravel (SM), or somewhere between. Depth intervals chosen from the boreholes included from 0-2 feet bgs, 2-4 feet bgs, 4-6 feet bgs, 9-11 feet bgs, 10-12 feet bgs, 14-16 feet bgs, and 20-22 feet bgs.

Geotechnical data files generated during the ESI were entered into USAEC's Installation Restoration Data Management Information System (IRDMIS) for permanent record keeping. Four types of files were recorded and entered, including:

- Geotechnical Field Drilling File (GFD) - information about drilling operations, descriptions of lithology encountered, soil sampling descriptions, and depth to first groundwater encountered.

- Geotechnical Well Construction File (GSC) - information about installation of the monitoring well, design and construction of the well to include: total depth; screen interval; annular materials (filter pack, bentonite, grout); lengths of stick-up, blank casing, screen; and casing diameter.

- Geotechnical Groundwater Stabilized File (CGS) - data on depth to stabilized groundwater surface (from ground surface), date reading was collected, method of measurement, and source of data (instrument operator).

- Geotechnical Aquifer Analysis File (GAQ) - information concerning the type of aquifer test conducted, date and duration of test, and test data collected or calculated from aquifer test.

These files were generated from field logbooks, boring logs, and field observations. Any observation made in the field that was not included on these forms was recorded permanently within the field logbooks.

TABLE 4.1
SUBSURFACE SOIL BACKGROUND ANALYTICAL RESULTS (ppm)

| PARAMETER | MW20-001 2-4' 03-Jun-93 | | MW20-001 4-6' 03-Jun-93 | | MW21-001 2-4' 02-Jun-93 | | MW21-001 4-6' 02-Jun-93 | | MW22-001 2-4' 09-Jun-93 | | AVERAGE BACKGROUND CONCENTRATION | AVERAGE 2 X BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | LT | 10 | LT | 10 | LT | 10 | LT | 10 | 5.00 | 10.00 |
| Mercury | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | 0.01 | 0.03 |
| Lead | | 3.89 | | 2.31 | | 5.52 | | 2.44 | | 2.03 | 3.24 | 6.48 |
| Thallium | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | 0.08 | 0.15 |
| Arsenic | | 0.503 | LT | 0.202 | | 2.52 | | 2.37 | | 1.35 | 1.37 | 2.74 |
| Selenium | LT | 0.202 | LT | 0.202 | LT | 0.202 | LT | 0.202 | | 3.3 | 0.74 | 1.48 |
| Aluminum | | 4140 | | 4630 | | 2960 | | 3070 | | 4920 | 3944.00 | 7888.00 |
| Iron | | 1630 | | 8300 | | 7400 | | 7300 | | 8700 | 6666.00 | 13332.00 |
| Magnesium | | 233 | | 496 | | 470 | | 453 | | 755 | 481.40 | 962.80 |
| Manganese | | 19.4 | | 14.2 | | 42.4 | | 89.4 | | 64.1 | 45.90 | 91.80 |
| Molybdenum | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | 0.50 | 1.00 |
| Nickel | LT | 1.54 | | 4.12 | | 4.04 | | 4.01 | | 6.25 | 3.84 | 7.68 |
| Potassium | LT | 119 | | 499 | | 274 | | 269 | | 381 | 296.50 | 593.00 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | 0.26 | 0.52 |
| Sodium | | 137 | | 72.6 | | 73.1 | | 78.9 | | 70.5 | 86.42 | 172.84 |
| Titanium | | 76.2 | | 94.4 | | 99.7 | | 105 | | 87.8 | 92.62 | 185.24 |
| Barium | | 21.2 | | 18.5 | | 4.7 | | 8.72 | | 14.5 | 13.52 | 27.05 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | 0.25 | 0.50 |
| Cadmium | LT | 0.515 | LT | 0.515 | LT | 0.515 | LT | 0.515 | LT | 0.515 | 0.26 | 0.52 |
| Chromium | | 4.39 | | 10.6 | | 8.3 | | 7.03 | | 11.1 | 8.28 | 16.57 |
| Cobalt | | 1.05 | | 2.12 | | 4.18 | | 4.48 | | 3.54 | 3.07 | 6.15 |
| Copper | LT | 0.937 | | 2.01 | | 1.88 | | 2.59 | | 2.45 | 1.88 | 3.76 |
| Vanadium | | 5.01 | | 10.7 | | 9.19 | | 9.07 | | 11.9 | 9.17 | 18.35 |
| Zinc | | 11.8 | | 10.1 | | 9.38 | | 20.4 | | 13.6 | 13.06 | 26.11 |
| Calcium | | 630 | | 206 | | 151 | | 248 | | 263 | 299.60 | 599.20 |

TABLE 4.1 (continued)
SUBSURFACE SOIL BACKGROUND ANALYTICAL RESULTS (ppm)

| PARAMETER | MW20-001 2-4' 03-Jun-93 | | MW20-001 4-6' 03-Jun-93 | | MW21-001 2-4' 02-Jun-93 | | MW21-001 4-6' 02-Jun-93 | | MW22-001 2-4' 09-Jun-93 | | AVERAGE BACKGROUND CONCENTRATION | AVERAGE 2 X BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzo[b]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | 0.04 | 0.09 |
| Benzo[k]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Bis(2-chloroisopropyl) ether | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Acenaphthylene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Bis(2-ethylhexyl) phthalate | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | 0.20 | 0.39 |
| Pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Benzo[a]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | 0.37 | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | 0.46 | 0.92 |
| Phenanthrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Toluene | | 0.012 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | 0.00 | 0.01 |
| Acetone | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | 0.02 | 0.05 |

2-4' = depth in feet of sample below grade.
ppm = parts per million or ug/g
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 4.2
SUBSURFACE SOIL ANALYTICAL RESULT (ppm)

| PARAMETER | MW2-001 2-4' 08-JUN-93 | | MW7-001 2-4' 07-Jun-93 | | MW8-001 2-4' 07-Jun-93 | | MW10-001 2-4' 08-Jun-93 | | MW11-001 2-4' 07-Jun-93 | | MW11-002 2-4' 08-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | LT | 10 | LT | 10 | LT | 10 | LT | 10 | LT | 10 |
| Mercury | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 |
| Lead | | 3.87 | | 1.38 | | 3.24 | | 3.74 | | 3.91 | | 4.66 |
| Arsenic | | 1.72 | | 0.386 | | 1.94 | | 5.62 | | 1.27 | | 2.27 |
| Selenium | | 0.422 | LT | 0.202 | LT | 0.202 | | 0.534 | | 0.344 | LT | 0.202 |
| Aluminum | | 7900 | | 2220 | | 3400 | | 2660 | | 5120 | | 4240 |
| Iron | | 13000 | | 3920 | | 7300 | | 8400 | | 5980 | | 8100 |
| Magnesium | | 437 | | 364 | | 491 | | 341 | | 760 | | 780 |
| Manganese | | 19.2 | | 22.9 | | 69.7 | | 13.5 | | 24.8 | | 65.6 |
| Molybdenum | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | | 4.15 | | 2.91 | | 4.01 | | 2.43 | | 4.47 | | 5.89 |
| Potassium | | 306 | | 308 | | 233 | | 243 | | 435 | | 424 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 61.8 | | 103 | | 82.1 | | 76.5 | | 74 | | 73.3 |
| Titanium | | 67.4 | | 85.8 | | 79.1 | | 60.2 | | 43.5 | | 68.4 |
| Barium | | 16.2 | | 7.63 | | 11.9 | | 16.6 | | 14.7 | | 15.7 |
| Beryllium | | 0.644 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Chromium | | 14.8 | | 6.5 | | 9.09 | | 7.17 | | 8.54 | | 9.44 |
| Cobalt | | 2.04 | | 1.9 | | 3.77 | | 2.42 | | 2.44 | | 4.69 |
| Copper | | 1.44 | | 2.5 | | 3.05 | | 1.65 | | 2.95 | | 5.76 |
| Vanadium | | 20.7 | | 5.98 | | 9.94 | | 8.83 | | 9.77 | | 10.1 |
| Zinc | | 20.1 | | 7.59 | | 15.3 | | 6.23 | | 10.7 | | 22.2 |
| Calcium | | 175 | | 142 | | 132 | | 119 | | 372 | | 285 |
| Benzo[b]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULT (ppm)

| PARAMETER | MW2-001 2-4' 08-JUN-93 | | MW7-001 2-4' 07-Jun-93 | | MW8-001 2-4' 07-Jun-93 | | MW10-001 2-4' 08-Jun-93 | | MW11-001 2-4' 07-Jun-93 | | MW11-002 2-4' 08-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 |
| Pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |
| Acetone | LT | 0.046 | | 0.11 | | 0.045 | | 0.057 | | 0.092 | LT | 0.046 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW12-001 2-4' 08-Jun-93 | | MW12-002 2-4' 09-Jun-93 | | MW13-001 2-4' 03-Jun-93 | | MW14-001 2-4' 08-Jun-93 | | MW14-002 2-4' 08-Jun-93 | | MW15-001 2-4' 08-Jun-93 | | MW16-001 2-4' 09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 26.9 | LT | 10 | | 72.8 | LT | 10 | LT | 10 | LT | 10 | LT | 10 |
| Mercury | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 |
| Lead | | 1.04 | | 5.46 | | 3.79 | | 2.85 | | 2.9 | | 2.1 | | 4.87 |
| Arsenic | | 7.38 | | 3.33 | | 2.89 | | 1.28 | | 1.8 | | 1.82 | | 2.09 |
| Selenium | | 0.313 | | 1.44 | LT | 0.202 | LT | 0.202 | | 0.339 | LT | 0.202 | | 2.12 |
| Aluminum | | 5650 | | 6900 | | 4770 | | 5340 | | 3060 | | 4820 | | 5250 |
| Iron | | 9300 | | 9800 | | 9600 | | 7300 | | 6050 | | 8600 | | 11000 |
| Magnesium | | 1020 | | 894 | | 802 | | 867 | | 627 | | 744 | | 1130 |
| Manganese | | 191 | | 49.4 | | 83.7 | | 31.2 | | 37.1 | | 71.4 | | 133 |
| Molybdenum | LT | 1 | | 1.5 | | 1.49 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | | 8 | | 7.14 | | 6.1 | | 5.2 | | 5.11 | | 5.28 | | 8.46 |
| Potassium | | 499 | | 422 | | 256 | | 517 | | 304 | | 369 | | 595 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 183 | | 74.3 | | 75.8 | | 73.6 | | 99.2 | | 79.5 | | 69 |
| Titanium | | 127 | | 70.9 | | 75.3 | | 61.1 | | 70.8 | | 78.3 | | 146 |
| Barium | | 33.4 | | 29 | | 19.7 | | 12.7 | | 10.4 | | 19.8 | | 19.1 |
| Beryllium | | 0.699 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Chromium | | 20.5 | | 10.5 | | 8.75 | | 11.8 | | 7.26 | | 9.63 | | 11.6 |
| Cobalt | | 5.23 | | 2.83 | | 4.21 | | 2.67 | | 2.74 | | 3.85 | | 5.31 |
| Copper | | 12.2 | | 4.78 | | 4.14 | | 4.1 | | 3 | | 5.89 | | 5.46 |
| Vanadium | | 16 | | 13.8 | | 11.5 | | 12.6 | | 7.94 | | 11.8 | | 14.7 |
| Zinc | | 64.8 | | 40.8 | | 37.2 | | 13 | | 12.6 | | 20.7 | | 19.2 |
| Calcium | | 415 | | 556 | | 242 | | 218 | | 144 | | 361 | | 445 |
| Benzo[b]fluoranthene | | 0.18 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Fluoranthene | | 0.21 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW12-001 2-4' 08-Jun-93 | | MW12-002 2-4' 09-Jun-93 | | MW13-001 2-4' 03-Jun-93 | | MW14-001 2-4' 08-Jun-93 | | MW14-002 2-4' 08-Jun-93 | | MW15-001 2-4' 08-Jun-93 | | MW16-001 2-4' 09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | | 0.56 | LT | 0.39 | LT | 0.39 |
| Pyrene | | 0.15 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | | 0.12 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | | 0.12 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | | 1.9 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | | 2.8 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | | 0.088 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | | 0.057 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |
| Acetone | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW16-001<br>4-6'<br>09-Jun-93 | | MW16-002<br>2-4'<br>09-Jun-93 | | MW16-003<br>2-4'<br>09-Jun-93 | | MW24-001<br>2-4'<br>09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | LT | 10 | | 29.4 | LT | 10 |
| Mercury | LT | 0.027 | | 0.036 | LT | 0.027 | LT | 0.027 |
| Lead | | 3.67 | | 1.6 | | 4.05 | | 2.67 |
| Arsenic | | 1.51 | | 5.67 | | 2.84 | | 2.04 |
| Selenium | LT | 2.02 | | 3.9 | | 4.53 | | 3.65 |
| Aluminum | | 4860 | | 4310 | | 6100 | | 6120 |
| Iron | | 10000 | | 5820 | | 11000 | | 13000 |
| Magnesium | | 870 | | 509 | | 1020 | | 1000 |
| Manganese | | 66.4 | | 59.3 | | 65.4 | | 58.5 |
| Molybdenum | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | | 5.56 | | 4.78 | | 6.2 | | 7.56 |
| Potassium | | 405 | | 323 | | 553 | | 516 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 72.6 | | 94 | | 65 | | 82.6 |
| Titanium | | 138 | | 70.6 | | 85.9 | | 110 |
| Barium | | 20.3 | | 33.1 | | 19 | | 23 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Chromium | | 11 | | 8.29 | | 10.9 | | 12.2 |
| Cobalt | | 3.59 | | 2.67 | | 3.38 | | 4.08 |
| Copper | | 4.61 | | 6.95 | | 4.18 | | 3.58 |
| Vanadium | | 13.9 | | 10.2 | | 13.9 | | 15.8 |
| Zinc | | 15.6 | | 19.6 | | 18.6 | | 15.6 |
| Calcium | | 414 | | 620 | | 524 | | 346 |
| Benzo[b]fluoranthene | LT | 0.033 | | 0.11 | LT | 0.033 | LT | 0.033 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW16-001<br>4-6'<br>09-Jun-93 | | MW16-002<br>2-4'<br>09-Jun-93 | | MW16-003<br>2-4'<br>09-Jun-93 | | MW24-001<br>2-4'<br>09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 |
| Pyrene | LT | 0.033 | | 0.061 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | LT | 0.033 | | 0.057 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | | 1.8 | | 1.8 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | LT | 0.033 | | 0.041 | LT | 0.033 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |
| Acetone | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | SB10-001 2-4' 07-Jun-93 | | SB11-001 2-4' 07-Jun-93 | | SB11-002 2-4' 07-Jun-93 | | SB11-003 2-4' 07-Jun-93 | | SB16-001 2-4' 02-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | | 106 | | 40.9 | LT | 10 | | 80.3 |
| Mercury | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 |
| Lead | | 2.58 | | 4.73 | | 2.39 | | 3.06 | | 6.79 |
| Arsenic | | 1.13 | | 4.06 | | 1.2 | | 2.6 | | 1.93 |
| Selenium | | 0.603 | | 0.334 | LT | 0.202 | LT | 0.202 | LT | 0.202 |
| Aluminum | | 4180 | | 4780 | | 3550 | | 4550 | | 3410 |
| Iron | | 7000 | | 10000 | | 4530 | | 9600 | | 7300 |
| Magnesium | | 973 | | 580 | | 491 | | 811 | | 701 |
| Manganese | | 78.9 | | 28.4 | | 21.5 | | 45.4 | | 39.6 |
| Molybdenum | LT | 1 | LT | 1 | LT | 1 | | 1.88 | LT | 1 |
| Nickel | | 7 | | 4.21 | | 3.33 | | 6.1 | | 4.97 |
| Potassium | | 578 | | 280 | | 156 | | 425 | | 376 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | | 0.743 | LT | 0.521 |
| Sodium | | 91.1 | | 75 | | 82.9 | | 88.3 | | 79.7 |
| Titanium | | 93.4 | | 52.1 | | 43.3 | | 65 | | 64.8 |
| Barium | | 17 | | 22.9 | | 16.4 | | 14.1 | | 11 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Chromium | | 8.8 | | 9.05 | | 5.76 | | 9.9 | | 10.4 |
| Cobalt | | 4.67 | | 1.99 | | 1.68 | | 4.33 | | 3.61 |
| Copper | | 3.45 | | 3.1 | | 2.25 | | 4.08 | | 4 |
| Vanadium | | 9.49 | | 11.6 | | 7.25 | | 11.7 | | 10.4 |
| Zinc | | 19.3 | | 14.1 | | 15.3 | | 18.9 | | 13.8 |
| Calcium | | 194 | | 374 | | 105 | | 549 | | 186 |
| Benzo[b]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 | LT | 0.085 |

TABLE 4.2 (continued)
SUBSURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | SB10-001<br>2-4'<br>07-Jun-93 | | SB11-001<br>2-4'<br>07-Jun-93 | | SB11-002<br>2-4'<br>07-Jun-93 | | SB11-003<br>2-4'<br>07-Jun-93 | | SB16-001<br>2-4'<br>02-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 | LT | 0.39 |
| Pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | | 0.005 |
| Acetone | LT | 0.046 | | 0.2E | | 0.12 | | 0.14 | | 0.052 |

2-4' = depth of sample below grade.
ppm = parts per million or ug/g
LT = Less than laboratory-certified detection limit
E = Element run with background correction (flagged code).
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 4.3
STATISTICAL EVALUATION OF SUBSURFACE SOIL SAMPLES (ppm)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION |
|---|---|---|---|---|
| Total petroleum hydrocarbons | 6/22 | 27 | 19.83 | 106 |
| Mercury | 1/22 | 5 | 0.01 | 0.036 |
| Lead | 22/22 | 100 | 3.43 | 6.79 |
| Arsenic | 22/22 | 100 | 2.58 | 7.38 |
| Selenium | 12/22 | 55 | 0.93 | 4.53 |
| Aluminum | 22/22 | 100 | 4690.45 | 7900 |
| Iron | 22/22 | 100 | 8481.82 | 13000 |
| Magnesium | 22/22 | 100 | 736.91 | 1130 |
| Manganese | 22/22 | 100 | 58.00 | 191 |
| Molybdenum | 3/22 | 14 | 0.65 | 1.88 |
| Nickel | 22/22 | 100 | 5.40 | 8.46 |
| Potassium | 22/22 | 100 | 387.41 | 595 |
| Silver | 1/22 | 5 | 0.28 | 0.743 |
| Sodium | 22/22 | 100 | 84.38 | 183 |
| Titanium | 22/22 | 100 | 79.86 | 146 |
| Barium | 22/22 | 100 | 18.35 | 33.4 |
| Beryllium | 2/22 | 9 | 0.29 | 0.699 |
| Chromium | 22/22 | 100 | 10.09 | 20.5 |
| Cobalt | 22/22 | 100 | 3.37 | 5.31 |
| Copper | 22/22 | 100 | 4.23 | 12.2 |
| Vanadium | 22/22 | 100 | 11.72 | 20.7 |
| Zinc | 22/22 | 100 | 20.06 | 64.8 |
| Calcium | 22/22 | 100 | 314.45 | 620 |
| Benzo[b]fluoranthene | 2/22 | 9 | 0.03 | 0.18 |
| Fluoranthene | 1/22 | 5 | 0.05 | 0.21 |

TABLE 4.3 (continued)
STATISTICAL EVALUATION OF SUBSURFACE SOIL SAMPLES (ppm)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION |
|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 1/22 | 5 | 0.21 | 0.56 |
| Pyrene | 2/22 | 9 | 0.02 | 0.15 |
| Benzo[a]pyrene | 2/22 | 9 | 0.02 | 0.12 |
| Benzo[a]anthracene | 1/22 | 5 | 0.02 | 0.12 |
| Benzoic acid | 1/22 | 5 | 0.43 | 1.9 |
| Di-n-butyl phthalate | 3/22 | 14 | 0.69 | 2.8 |
| Phenanthrene | 2/22 | 9 | 0.02 | 0.088 |
| Indeno[1,2,3-C,D]pyrene | 1/22 | 5 | 0.02 | 0.057 |
| Toluene | 1/22 | 5 | 0.00 | 0.005 |
| Acetone | 8/22 | 36 | 0.05 | 0.2 |

ppm = parts per million or ug/g
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 4.4
SUBSURFACE SOIL DATA COMPARISON (ppm)

| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEEDING NJDEPE CRITERIA[c] |
|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | 19.83 | 106 | 10.00 | 6 | 1000 | 0 |
| Mercury | 0.01 | 0.036 | 0.03 | 1 | 270[b] | 0 |
| Lead | 3.43 | 6.79 | 6.48 | 1 | 600[b] | 0 |
| Arsenic | 2.58 | 7.38 | 2.74 | 7 | 20[a] | 0 |
| Selenium | 0.93 | 4.53 | 1.48 | 4 | 3100[b] | 0 |
| Aluminum | 4690.45 | 7900 | 7888.00 | 1 | * | N/A |
| Iron | 8481.82 | 13000 | 13332.00 | 0 | * | N/A |
| Magnesium | 736.91 | 1130 | 962.80 | 5 | * | N/A |
| Manganese | 58.00 | 191 | 91.80 | 2 | * | N/A |
| Molybdenum | 0.65 | 1.88 | 1.00 | 2 | * | N/A |
| Nickel | 5.40 | 8.46 | 7.68 | 2 | 2400[b] | 0 |
| Potassium | 387.41 | 595 | 593.00 | 1 | * | N/A |
| Silver | 0.28 | 0.743 | 0.52 | 1 | 4100[b] | 0 |
| Sodium | 84.38 | 183 | 172.84 | 1 | * | N/A |
| Titanium | 79.86 | 146 | 185.24 | 0 | * | N/A |
| Barium | 18.35 | 33.4 | 27.05 | 3 | 47000[b] | 0 |
| Beryllium | 0.29 | 0.699 | 0.50 | 2 | 1[b] | 0 |
| Chromium | 10.09 | 20.5 | 16.57 | 1 | * | N/A |
| Cobalt | 3.37 | 5.31 | 6.15 | 0 | * | N/A |
| Copper | 4.23 | 12.2 | 3.76 | 12 | 600[b] | 0 |
| Vanadium | 11.72 | 20.7 | 18.35 | 1 | 7100[b] | 0 |
| Zinc | 20.06 | 64.8 | 26.11 | 3 | 1500[b] | 0 |
| Calcium | 314.45 | 620 | 599.20 | 1 | * | N/A |
| Benzo[b]fluoranthene | 0.03 | 0.18 | 0.03 | 2 | 500 | 0 |

TABLE 4.4 (continued)
SUBSURFACE SOIL DATA COMPARISON (ppm)

| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEEDING NJDEPE CRITERIA[c] |
|---|---|---|---|---|---|---|
| Fluoranthene | 0.05 | 0.21 | 0.09 | 1 | 500 | 0 |
| Bis(2-ethylhexyl) phthalate | 0.21 | 0.56 | 0.39 | 1 | 100 | 0 |
| Pyrene | 0.02 | 0.15 | 0.03 | 2 | 500 | 0 |
| Benzo[a]pyrene | 0.02 | 0.12 | 0.03 | 2 | 100 | 0 |
| Benzo[a]anthracene | 0.02 | 0.12 | 0.03 | 1 | 500 | 0 |
| Benzoic acid | 0.43 | 1.9 | 0.73 | 1 | * | N/A |
| Di-n-butyl phthalate | 0.69 | 2.8 | 0.92 | 3 | 100 | 0 |
| Phenanthrene | 0.02 | 0.088 | 0.03 | 2 | * | N/A |
| Indeno[1,2,3-C,D]pyrene | 0.02 | 0.057 | 0.03 | 1 | 500 | 0 |
| Toluene | 0.00 | 0.005 | 0.01 | 0 | 100 | 0 |
| Acetone | 0.05 | 0.2 | 0.05 | 7 | 50 | 0 |

a. NJDEPE Proposed Cleanup Standards for Contaminated Sites - Impact to Groundwater Standards (unless otherwise noted).
b. NJDEPE Proposed Cleanup Standards for Contaminated Sites - Non-residential Direct Contact Standards
c. Comparison to Cleanup Criteria Conducted for Data Points in Excess of 2 Times Background
* = No standard available
ppm = parts per million or ug/g
N/A = not applicable

TABLE 4.5
SURFACE SOIL BACKGROUND ANALYTICAL RESULTS (ppm)

| PARAMETER | MW20-001 03-Jun-93 | | MW21-001 02-Jun-93 | | MW22-001 09-Jun-93 | | AVERAGE BACKGROUND CONCENTRATION | AVERAGE 2 X BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | | 18.6 | | 19.3 | 14.30 | 28.60 |
| Mercury | | 0.032 | LT | 0.027 | LT | 0.027 | 0.02 | 0.04 |
| Lead | | 9.91 | | 66 | | 1.4 | 25.77 | 51.54 |
| Thallium | LT | 0.153 | | 0.175 | LT | 0.153 | 0.11 | 0.22 |
| Arsenic | | 2.19 | | 2.66 | | 2.12 | 2.32 | 4.65 |
| Selenium | LT | 0.202 | LT | 0.202 | LT | 0.202 | 0.10 | 0.20 |
| Aluminum | | 3790 | | 2960 | | 3930 | 3560.00 | 7120.00 |
| Iron | | 7800 | | 4420 | | 8000 | 6740.00 | 13480.00 |
| Magnesium | | 649 | | 315 | | 548 | 504.00 | 1008.00 |
| Manganese | | 44.2 | | 152 | | 71.7 | 89.30 | 178.60 |
| Molybdenum | LT | 1 | LT | 1 | LT | 1 | 0.50 | 1.00 |
| Nickel | | 4.82 | | 2.5 | | 3.84 | 3.72 | 7.44 |
| Potassium | | 289 | LT | 119 | | 230 | 192.83 | 385.67 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | 0.26 | 0.52 |
| Sodium | | 75.9 | | 65.8 | | 83.7 | 75.13 | 150.27 |
| Titanium | | 61.3 | | 64.3 | | 72.6 | 66.07 | 132.13 |
| Barium | | 16.7 | | 19.5 | | 21.7 | 19.30 | 38.60 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | 0.25 | 0.50 |
| Cadmium | LT | 0.515 | LT | 0.515 | LT | 0.515 | 0.26 | 0.52 |
| Chromium | | 7.58 | | 5.06 | | 9.63 | 7.42 | 14.85 |
| Cobalt | | 2.43 | | 2.01 | | 2.24 | 2.23 | 4.45 |
| Copper | | 4.46 | | 4.17 | | 4.39 | 4.34 | 8.68 |
| Vanadium | | 9.82 | | 7.31 | | 12.8 | 9.98 | 19.95 |
| Zinc | | 16.1 | | 13.9 | | 20.3 | 16.77 | 33.53 |
| Calcium | | 382 | | 182 | | 508 | 357.33 | 714.67 |

TABLE 4.5 (continued)
SURFACE SOIL BACKGROUND ANALYTICAL RESULTS (ppm)

| PARAMETER | MW20-001 03-Jun-93 | | MW21-001 02-Jun-93 | | MW22-001 09-Jun-93 | | AVERAGE BACKGROUND CONCENTRATION | AVERAGE 2 X BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|
| Benzo[b]fluoranthene | LT | 0.033 | | 0.1 | | 0.41 | 0.18 | 0.35 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | | 0.46 | 0.18 | 0.36 |
| Benzo[k]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Acenaphthylene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Chrysene | LT | 0.22 | LT | 0.22 | LT | 0.22 | 0.11 | 0.22 |
| Anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Pyrene | LT | 0.033 | | 0.066 | | 0.33 | 0.14 | 0.28 |
| Dibenzofuran | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Benzo[a]pyrene | LT | 0.033 | | 0.057 | | 0.23 | 0.10 | 0.20 |
| Dibenz[ah]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | | 0.17 | 0.07 | 0.14 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | 0.37 | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | 0.46 | 0.92 |
| Phenanthrene | LT | 0.033 | | 0.064 | | 0.24 | 0.11 | 0.21 |
| Naphthalene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| 2-Methylnaphthalene | LT | 0.033 | LT | 0.033 | LT | 0.033 | 0.02 | 0.03 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | LT | 0.033 | | 0.13 | 0.05 | 0.11 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | 0.00 | 0.00 |
| Acetone | LT | 0.046 | LT | 0.046 | LT | 0.046 | 0.02 | 0.05 |
| Methylene chloride | LT | 0.04 | LT | 0.04 | LT | 0.04 | 0.02 | 0.04 |
| Trichlorofluoromethane | LT | 0.002 | LT | 0.002 | LT | 0.002 | 0.00 | 0.00 |
| PETN | LT | 4I | | 11.9I | LT | 4 | 5.30 | 10.60 |

ppm = parts per million or ug/g
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.
I = Low spike recovery high

TABLE 4.6
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW2-001 08-Jun-93 | | MW7-001 07-Jun-93 | | MW8-001 07-Jun-93 | | MW10-001 08-Jun-93 | | MW11-001 07-Jun-93 | | MW11-002 08-Jun-93 | | MW12-001 08-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 24.3 | LT | 10 | LT | 10 | | 13.5 | LT | 10 | | 22.2 | LT | 10 |
| Mercury | LT | 0.027 | | 0.034 | LT | 0.027 | LT | 0.027 | | 0.038 | LT | 0.027 | LT | 0.027 |
| Lead | | 4.3 | | 5.41 | | 130 | | 2.5 | | 1.1 | | 2.9 | | 3.8 |
| Thallium | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 |
| Arsenic | | 2.34 | | 2.96 | | 6.28 | | 16 | | 3.32 | | 2.14 | | 34 |
| Selenium | LT | 0.202 | | 0.645 | | 0.277 | | 0.762 | | 0.274 | LT | 0.202 | | 1.02 |
| Aluminum | | 1880 | | 3180 | | 3810 | | 2390 | | 5410 | | 3630 | | 6080 |
| Iron | | 2820 | | 4310 | | 6800 | | 7100 | | 9300 | | 6000 | | 8100 |
| Magnesium | | 267 | | 273 | | 515 | | 355 | | 836 | | 1850 | | 979 |
| Manganese | | 20.9 | | 26.7 | | 31.3 | | 30.1 | | 137 | | 91 | | 173 |
| Molybdenum | LT | 1 | | 1.37 | | 1.28 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | LT | 1.54 | | 2.78 | | 4.09 | | 3.85 | | 6.16 | | 5.37 | | 7.05 |
| Potassium | | 215 | | 238 | | 250 | | 278 | | 583 | | 345 | | 490 |
| Silver | LT | 0.521 | | 0.68 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 85.2 | | 97.2 | | 75.4 | | 102 | | 204 | | 64 | | 89.5 |
| Titanium | | 49.5 | | 63.8 | | 92.1 | | 63 | | 56.2 | | 77.3 | | 113 |
| Barium | | 18.3 | | 20.3 | | 21.8 | | 24.7 | | 369 | | 21.6 | | 35.4 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Cadmium | LT | 0.515 | LT | 0.515 | LT | 0.515 | LT | 0.515 | | 24.8 | LT | 0.515 | LT | 0.515 |
| Chromium | | 5.58 | | 6.11 | | 8.86 | | 6.23 | | 9.73 | | 8.39 | | 17 |
| Cobalt | | 0.886 | | 2.14 | | 2.84 | | 2.47 | | 3.56 | | 3.12 | | 4.8 |
| Copper | | 8.93 | | 3.65 | | 6.53 | | 4.05 | | 16.1 | | 9.21 | | 10.2 |
| Vanadium | | 6.11 | | 7.55 | | 11.5 | | 9.3 | | 12.1 | | 9.03 | | 15 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW2-001 08-Jun-93 | | MW7-001 07-Jun-93 | | MW8-001 07-Jun-93 | | MW10-001 08-Jun-93 | | MW11-001 07-Jun-93 | | MW11-002 08-Jun-93 | | MW12-001 08-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zinc | | 25.1 | | 11.4 | | 22.8 | | 10.5 | | 109 | | 27.3 | | 53.4 |
| Calcium | | 795 | | 241 | | 287 | | 514 | | 1040 | | 3270 | | 358 |
| Benzo[b]fluoranthene | | 0.14 | LT | 0.033 | | 0.3 | | 0.089 | | 0.53 | | 0.078 | | 0.062 |
| Fluoranthene | LT | 0.085 | LT | 0.085 | | 0.22 | LT | 0.085 | | 0.39 | LT | 0.085 | | 0.13 |
| Benzo[k]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.1 |
| Acenaphthylene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Chrysene | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 |
| Anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.05 | LT | 0.033 | LT | 0.033 |
| Pyrene | | 0.061 | LT | 0.033 | | 0.15 | | 0.059 | | 0.27 | | 0.044 | | 0.086 |
| Dibenzofuran | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | | 0.094 | LT | 0.033 | | 0.17 | | 0.044 | | 0.35 | | 0.04 | | 0.085 |
| Dibenz[ah]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | LT | 0.033 | LT | 0.033 | | 0.083 | | 0.046 | | 0.23 | LT | 0.033 | | 0.075 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | | 0.048 | LT | 0.033 | | 0.12 | | 0.076 | | 0.17 | LT | 0.033 | | 0.055 |
| Naphthalene | LT | 0.033 | LT | 0.033 | | 0.057 | | 0.059 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| 2-Methylnaphthalene | LT | 0.033 | LT | 0.033 | | 0.05 | | 0.058 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | | 0.069 | LT | 0.033 | | 0.083 | LT | 0.033 | | 0.22 | LT | 0.033 | | 0.049 |
| Toluene | LT | 0.002 | | 0.003 | LT | 0.002 | | 0.005 | | 0.014 | LT | 0.002 | LT | 0.002 |
| Acetone | LT | 0.046 | | 0.037 | LT | 0.046 | LT | 0.046 | | 0.054 | LT | 0.046 | LT | 0.046 |
| Methylene chloride | | 0.05 | LT | 0.04 | LT | 0.04 | | 0.085 | | 0.18 | LT | 0.04 | LT | 0.04 |
| Trichlorofluoromethane | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | | 0.003 | LT | 0.002 | LT | 0.002 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW12-002 09-Jun-93 | | MW13-001 03-Jun-93 | | MW14-001 08-Jun-93 | | MW14-002 08-Jun-93 | | MW15-001 08-Jun-93 | | MW16-002 09-Jun-93 | | MW16-003 09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 17.9 | | 22 | | 30.8 | LT | 10 | LT | 10 | LT | 10 | LT | 10 |
| Mercury | | 0.039 | | 0.154 | LT | 0.027 | LT | 0.027 | LT | 0.027 | LT | 0.027 | | 0.047 |
| Lead | | 1.4 | | 120 | | 5.2 | | 4.01 | | 3.9 | | 1.07 | | 1.5 |
| Thallium | LT | 0.153 | | 0.204 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 |
| Arsenic | | 9.78 | | 11.4 | | 5.53 | | 1.56 | | 2.96 | | 5.33 | | 5.81 |
| Selenium | | 5.4 | | 1.12 | LT | 0.202 | | 0.577 | LT | 0.202 | | 2.5 | | 2.14 |
| Aluminum | | 7300 | | 11000 | | 4090 | | 4040 | | 4110 | | 5410 | | 4590 |
| Iron | | 16000 | | 25000 | | 6010 | | 5200 | | 5300 | | 8700 | | 7200 |
| Magnesium | | 1470 | | 2840 | | 526 | | 585 | | 571 | | 756 | | 670 |
| Manganese | | 303 | | 966 | | 27.6 | | 41.4 | | 123 | | 92.9 | | 163 |
| Molybdenum | | 3.09 | | 2.24 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| Nickel | | 13.7 | | 27.1 | | 5.85 | | 4.6 | | 4.15 | | 7.38 | | 5.84 |
| Potassium | | 744 | | 1230 | | 270 | | 253 | | 289 | | 498 | | 344 |
| Silver | | 2.91 | | 1.13 | | 0.899 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 174 | | 133 | | 98.3 | | 107 | | 72.6 | | 76.3 | | 151 |
| Titanium | | 137 | | 583 | | 57.7 | | 66.3 | | 49 | | 93.9 | | 65.2 |
| Barium | | 221 | | 93.4 | | 29.9 | | 19.1 | | 25.2 | | 33.4 | | 35.8 |
| Beryllium | LT | 0.5 | | 0.895 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Cadmium | | 1.4 | | 1.58 | LT | 0.515 | LT | 0.515 | LT | 0.515 | LT | 0.515 | LT | 0.515 |
| Chromium | | 25.6 | | 65.1 | | 9.1 | | 6.87 | | 7.63 | | 12.9 | | 8.09 |
| Cobalt | | 7.32 | | 15.5 | | 2.87 | | 3.05 | | 2.8 | | 3.67 | | 2.56 |
| Copper | | 125 | | 52.2 | | 10.6 | | 3.96 | | 5.36 | | 7.49 | | 7.21 |
| Vanadium | | 20.3 | | 52.5 | | 15.5 | | 8.37 | | 9.01 | | 14.9 | | 10.3 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | MW12-002 09-Jun-93 | | MW13-001 03-Jun-93 | | MW14-001 08-Jun-93 | | MW14-002 08-Jun-93 | | MW15-001 08-Jun-93 | | MW16-002 09-Jun-93 | | MW16-003 09-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zinc | | 498 | | 223 | | 26.6 | | 17 | | 20.4 | | 24.6 | | 23.7 |
| Calcium | | 5010 | | 1500 | | 236 | | 195 | | 301 | | 742 | | 1140 |
| Benzo[b]fluoranthene | | 0.23 | | 0.49 | | 0.22 | LT | 0.033 | | 0.056 | | 0.088 | | 0.13 |
| Fluoranthene | | 0.24 | | 0.39 | | 0.24 | LT | 0.085 | | 0.085 | LT | 0.085 | LT | 0.085 |
| Benzo[k]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Acenaphthylene | LT | 0.033 | | 0.071 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Chrysene | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 | LT | 0.22 |
| Anthracene | LT | 0.033 | | 0.054 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Pyrene | | 0.15 | | 0.34 | | 0.16 | LT | 0.033 | LT | 0.033 | | 0.058 | | 0.079 |
| Dibenzofuran | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]pyrene | | 0.12 | | 0.31 | | 0.14 | LT | 0.033 | LT | 0.033 | | 0.043 | | 0.058 |
| Dibenz[ah]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Benzo[a]anthracene | | 0.088 | | 0.22 | | 0.092 | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.05 |
| Benzoic acid | | 1.8 | LT | 0.73 | | 3.6 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | | 1.9 | LT | 0.92 | LT | 0.92 | | 2 |
| Phenanthrene | | 0.12 | | 0.24 | | 0.12 | LT | 0.033 | LT | 0.033 | | 0.057 | | 0.057 |
| Naphthalene | LT | 0.033 | | 0.12 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| 2-Methylnaphthalene | LT | 0.033 | | 0.088 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.039 |
| Indeno[1,2,3-C,D]pyrene | | 0.091 | | 0.16 | | 0.079 | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.047 |
| Toluene | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |
| Acetone | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 | LT | 0.046 |
| Methylene chloride | LT | 0.04 | LT | 0.04 | LT | 0.04 | LT | 0.04 | LT | 0.04 | LT | 0.04 | LT | 0.04 |
| Trichlorofluoromethane | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | SB10-001 07-Jun-93 | | SB11-001 07-Jun-93 | | SB11-002 07-Jun-93 | | SB11-003 07-Jun-93 | | SB16-001 02-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 10 | | 177 | | 97 | | 102 | | 64.5 |
| Mercury | LT | 0.027 | | 0.193 | | 0.051 | LT | 0.027 | LT | 0.027 |
| Lead | | 2.89 | | 220 | | 10.5 | | 42 | | 2.18 |
| Thallium | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 | LT | 0.153 |
| Arsenic | | 11 | | 35 | | 2.53 | | 29 | | 0.798 |
| Selenium | LT | 0.202 | | 0.766 | LT | 0.202 | | 0.316 | | 0.267 |
| Aluminum | | 3580 | | 4870 | | 3960 | | 6800 | | 2230 |
| Iron | | 8000 | | 29000 | | 7500 | | 8200 | | 4220 |
| Magnesium | | 748 | | 1300 | | 613 | | 1980 | | 564 |
| Manganese | | 52.5 | | 142 | | 57.2 | | 503 | | 39.9 |
| Molybdenum | LT | 1 | | 3.37 | LT | 1 | | 1.96 | LT | 1 |
| Nickel | | 5.21 | | 17.5 | | 4.86 | | 7.46 | | 4.03 |
| Potassium | | 275 | | 439 | | 298 | | 510 | | 273 |
| Silver | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 | LT | 0.521 |
| Sodium | | 68.5 | | 84.7 | | 83.9 | | 258 | | 101 |
| Titanium | | 71.6 | | 111 | | 66.3 | | 252 | | 68.7 |
| Barium | | 21.1 | | 192 | | 18.6 | | 138 | | 7.53 |
| Beryllium | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 | LT | 0.5 |
| Cadmium | LT | 0.515 | | 5.9 | LT | 0.515 | LT | 0.515 | LT | 0.515 |
| Chromium | | 7.56 | | 15.1 | | 8.7 | | 9.03 | | 5.62 |
| Cobalt | | 2.63 | | 8.43 | | 4.69 | | 5.12 | | 2.75 |
| Copper | | 3.46 | | 994 | | 6.51 | | 22 | | 2.7 |
| Vanadium | | 9.56 | | 12.7 | | 10.1 | | 11.4 | | 5.56 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | SB10-001 07-Jun-93 | | SB11-001 07-Jun-93 | | SB11-002 07-Jun-93 | | SB11-003 07-Jun-93 | | SB16-001 02-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Zinc | | 15.7 | | 721 | | 45.8 | | 47.1 | | 15 |
| Calcium | | 314 | | 3620 | | 219 | | 12000 | | 113 |
| Benzo[b]fluoranthene | LT | 0.033 | | 0.55 | | 0.6 | | 0.91 | LT | 0.033 |
| Fluoranthene | LT | 0.085 | | 0.34 | | 0.36 | | 0.43 | LT | 0.085 |
| Benzo[k]fluoranthene | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 | LT | 0.033 |
| Acenaphthylene | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.079 | LT | 0.033 |
| Chrysene | LT | 0.22 | | 0.29 | | 0.49 | | 0.37 | LT | 0.22 |
| Anthracene | LT | 0.033 | | 0.046 | | 0.046 | | 0.069 | LT | 0.033 |
| Pyrene | LT | 0.033 | | 0.33 | | 0.36 | | 0.29 | LT | 0.033 |
| Dibenzofuran | LT | 0.033 | | 0.04 | LT | 0.033 | | 0.049 | LT | 0.033 |
| Benzo[a]pyrene | LT | 0.033 | | 0.3 | | 0.32 | | 0.39 | LT | 0.033 |
| Dibenz[ah]anthracene | LT | 0.033 | LT | 0.033 | LT | 0.033 | | 0.095 | LT | 0.033 |
| Benzo[a]anthracene | LT | 0.033 | | 0.24 | | 0.34 | | 0.2 | LT | 0.033 |
| Benzoic acid | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 | LT | 0.73 |
| Di-n-butyl phthalate | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 | LT | 0.92 |
| Phenanthrene | LT | 0.033 | | 0.17 | | 0.082 | | 0.18 | LT | 0.033 |
| Naphthalene | LT | 0.033 | | 0.13 | LT | 0.033 | | 0.11 | LT | 0.033 |
| 2-Methylnaphthalene | LT | 0.033 | | 0.16 | LT | 0.033 | | 0.12 | LT | 0.033 |
| Indeno[1,2,3-C,D]pyrene | LT | 0.033 | | 0.12 | | 0.13 | | 0.19 | LT | 0.033 |
| Toluene | LT | 0.002 | | 0.002 | LT | 0.002 | | 0.006 | | 0.002 |
| Acetone | LT | 0.046 | LT | 0.046 | | 0.089 | LT | 0.046 | LT | 0.046 |

TABLE 4.6 (continued)
SURFACE SOIL ANALYTICAL RESULTS (ppm)

| PARAMETER | SB10-001 07-Jun-93 | | SB11-001 07-Jun-93 | | SB11-002 07-Jun-93 | | SB11-003 07-Jun-93 | | SB16-001 02-Jun-93 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Methylene chloride | LT | 0.04 | | 0.073 | LT | 0.04 | | 0.07 | LT | 0.04 |
| Trichlorofluoromethane | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 | LT | 0.002 |

Note: Table includes only those parameters detected above laboratory-certified detection limits.
ppm = parts per million or ug/g
LT = Less than laboratory-certified detection limit
I = Low spike recovery high

TABLE 4.7
STATISTICAL EVALUATION OF SURFACE SOIL SAMPLES (ppm)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION |
|---|---|---|---|---|
| Total petroleum hydrocarbons | 10/19 | 53 | 32.43 | 177 |
| Mercury | 7/19 | 37 | 0.04 | 0.193 |
| Lead | 19/19 | 100 | 29.72 | 220 |
| Thallium | 1/19 | 5 | 0.08 | 0.204 |
| Arsenic | 19/19 | 100 | 9.88 | 35 |
| Selenium | 13/19 | 68 | 0.88 | 5.4 |
| Aluminum | 19/19 | 100 | 4650.53 | 11000 |
| Iron | 19/19 | 100 | 9197.89 | 29000 |
| Magnesium | 19/19 | 100 | 931.47 | 2840 |
| Manganese | 19/19 | 100 | 159.03 | 966 |
| Molybdenum | 6/19 | 32 | 1.04 | 3.37 |
| Nickel | 18/19 | 95 | 7.25 | 27.1 |
| Potassium | 19/19 | 100 | 411.68 | 1230 |
| Silver | 4/19 | 21 | 0.50 | 2.91 |
| Sodium | 19/19 | 100 | 111.87 | 258 |
| Titanium | 19/19 | 100 | 112.45 | 583 |
| Barium | 19/19 | 100 | 70.85 | 369 |
| Beryllium | 1/19 | 5 | 0.28 | 0.895 |
| Cadmium | 4/19 | 21 | 1.98 | 24.8 |
| Chromium | 19/19 | 100 | 12.80 | 65.1 |
| Cobalt | 19/19 | 100 | 4.27 | 15.5 |
| Copper | 19/19 | 100 | 68.38 | 994 |
| Vanadium | 19/19 | 100 | 13.20 | 52.5 |
| Zinc | 19/19 | 100 | 101.97 | 721 |
| Calcium | 19/19 | 100 | 1678.68 | 12000 |

TABLE 4.7 (continued)
STATISTICAL EVALUATION OF SURFACE SOIL SAMPLES (ppm)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION |
|---|---|---|---|---|
| Benzo[b]fluoranthene | 15/19 | 79 | 0.24 | 0.91 |
| Fluoranthene | 10/19 | 53 | 0.17 | 0.43 |
| Benzo[k]fluoranthene | 1/19 | 5 | 0.02 | 0.1 |
| Acenaphthylene | 2/19 | 11 | 0.02 | 0.079 |
| Chrysene | 3/19 | 16 | 0.15 | 0.49 |
| Anthracene | 5/19 | 26 | 0.03 | 0.069 |
| Pyrene | 14/19 | 74 | 0.13 | 0.36 |
| Dibenzofuran | 2/19 | 11 | 0.02 | 0.049 |
| Benzo[a]pyrene | 14/19 | 74 | 0.13 | 0.39 |
| Dibenz[ah]anthracene | 1/19 | 5 | 0.02 | 0.095 |
| Benzo[a]anthracene | 11/19 | 58 | 0.09 | 0.34 |
| Benzoic acid | 2/19 | 11 | 0.61 | 3.6 |
| Di-n-butyl phthalate | 2/19 | 11 | 0.62 | 2 |
| Phenanthrene | 13/19 | 68 | 0.08 | 0.24 |
| Naphthalene | 5/19 | 26 | 0.04 | 0.13 |
| 2-Methylnaphthalene | 6/19 | 32 | 0.04 | 0.16 |
| Indeno[1,2,3-C,D]pyrene | 11/19 | 58 | 0.07 | 0.22 |
| Toluene | 6/19 | 32 | 0.00 | 0.014 |
| Acetone | 3/19 | 16 | 0.03 | 0.089 |
| Methylene chloride | 5/19 | 26 | 0.04 | 0.18 |
| Trichlorofluoromethane | 1/19 | 5 | 0.00 | 0.003 |

ppm = parts per million or ug/g
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 4.8
SURFACE SOIL DATA COMPARISION (ppm)

| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEEDING NJDEPE CRITERIA[b] |
|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | 32.43 | 177 | 28.60 | 5 | 10000 | 0 |
| Mercury | 0.04 | 0.193 | 0.04 | 3 | 14 | 0 |
| Lead | 29.72 | 220 | 51.54 | 3 | 250 | 0 |
| Thallium | 0.08 | 0.204 | 0.22 | 0 | 2 | N/A |
| Arsenic | 9.88 | 35 | 4.65 | 11 | 20 | 3 |
| Selenium | 0.88 | 5.4 | 0.20 | 13 | 63 | 0 |
| Aluminum | 4650.53 | 11000 | 7120.00 | 2 | * | N/A |
| Iron | 9197.89 | 29000 | 13480.00 | 3 | * | N/A |
| Magnesium | 931.47 | 2840 | 1008.00 | 5 | * | N/A |
| Manganese | 159.03 | 966 | 178.60 | 3 | * | N/A |
| Molybdenum | 1.04 | 3.37 | 1.00 | 6 | * | N/A |
| Nickel | 7.25 | 27.1 | 7.44 | 4 | 250 | 0 |
| Potassium | 411.68 | 1230 | 385.67 | 7 | * | N/A |
| Silver | 0.50 | 2.91 | 0.52 | 4 | 110 | 0 |
| Sodium | 111.87 | 258 | 150.27 | 4 | * | N/A |
| Titanium | 112.45 | 583 | 132.13 | 3 | * | N/A |
| Barium | 70.85 | 369 | 38.60 | 4 | 700 | 0 |
| Beryllium | 0.28 | 0.895 | 0.50 | 1 | * | N/A |
| Cadmium | 1.98 | 24.8 | 0.52 | 3 | 1 | 4 |
| Chromium | 12.80 | 65.1 | 14.85 | 4 | * | N/A |
| Cobalt | 4.27 | 15.5 | 4.45 | 5 | * | N/A |
| Copper | 68.38 | 994 | 8.68 | 8 | 600 | 1 |

TABLE 4.8 (continued)
SURFACE SOIL DATA COMPARISION (ppm)

| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEEDING NJDEPE CRITERIA[b] |
|---|---|---|---|---|---|---|
| Vanadium | 13.20 | 52.5 | 19.95 | 2 | 370 | 0 |
| Zinc | 101.97 | 721 | 33.53 | 6 | 1500 | 0 |
| Calcium | 1678.68 | 12000 | 714.67 | 9 | * | N/A |
| Benzo[b]fluoranthene | 0.24 | 0.91 | 0.35 | 5 | 0.9 | 1 |
| Fluoranthene | 0.17 | 0.43 | 0.36 | 3 | 2300 | 0 |
| Benzo[k]fluoranthene | 0.02 | 0.1 | 0.03 | 1 | 0.9 | 0 |
| Acenaphthene | 0.02 | 0.079 | 0.03 | 2 | 3400 | 0 |
| Chrysene | 0.15 | 0.49 | 0.22 | 3 | 9 | 0 |
| Anthracene | 0.03 | 0.069 | 0.03 | 4 | 10000 | 0 |
| Pyrene | 0.13 | 0.36 | 0.28 | 3 | 1700 | 0 |
| Dibenzofuran | 0.02 | 0.049 | 0.03 | 2 | * | N/A |
| Benzo[a]pyrene | 0.13 | 0.39 | 0.20 | 5 | 0.66 | 0 |
| Dibenz[ah]anthracene | 0.02 | 0.095 | 0.03 | 1 | 0.66 | 0 |
| Benzo[a]anthracene | 0.09 | 0.34 | 0.14 | 5 | 0.9 | 0 |
| Benzoic acid | 0.61 | 3.6 | 0.73 | 2 | * | N/A |
| Di-n-butyl phthalate | 0.62 | 2 | 0.92 | 2 | 5700 | 0 |
| Phenanthrene | 0.08 | 0.24 | 0.21 | 1 | * | N/A |
| Naphthalene | 0.04 | 0.13 | 0.03 | 5 | 230 | 0 |
| 2-Methylnaphthalene | 0.04 | 0.16 | 0.03 | 6 | * | N/A |
| Indeno[1,2,3-C,D]pyrene | 0.07 | 0.22 | 0.11 | 5 | 0.9 | 0 |
| Toluene | 0.00 | 0.014 | 0.002 | 4 | 1000 | 0 |
| Acetone | 0.03 | 0.089 | 0.05 | 1 | 1000 | 0 |

TABLE 4.8 (continued)
SURFACE SOIL DATA COMPARISION (ppm)

| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEEDING NJDEPE CRITERIA[b] |
|---|---|---|---|---|---|---|
| Methylene chloride | 0.04 | 0.18 | 0.04 | 5 | 49 | 0 |
| Trichlorofluoromethane | 0.00 | 0.003 | 0.002 | 1 | * | N/A |

a. NJDEPE Proposed Cleanup Standards for Contaminated Sites - Residential Direct Contact Standards
b. Comparison to Cleanup Criteria Conducted for Data Points in Excess of 2 Times Background
* = No standard available
ppm = parts per million or ug/g
N/A = not applicable

## 5.0 GROUNDWATER

### 5.1 Groundwater Monitoring

Both monitoring wells and piezometers were installed at PSF to determine the presence or absence of groundwater contaminants and to define the local hydrogeologic conditions. Of the 27 borings installed on-site, 19 were converted into 4-inch diameter monitoring wells, and 3 into 2-inch diameter piezometers. Construction details of the wells are summarized in Table 5.1 and their locations are depicted on Figure 4.1. Generally, each well was completed using a 10-foot length of 4-inch diameter, 0.010 machine-slotted, schedule 40 PVC screen, set to extend above the water table, and varying lengths of 4-inch schedule 40 PVC casing, flush-jointed and threaded, extending approximately 2 feet above grade. Piezometers were set much the same, with 2-inch diameter PVC. The portion of each well/piezometer above grade was surrounded by a locking steel casing, encased in a concrete block, and surrounded by 4 pickets, per USAEC instructions (Appendix A, Photograph 7). Monitoring wells/piezometers installed during the ESI were screened at water table depths primarily based on the assumption that impacts to groundwater would likely be petroleum hydrocarbon-related. Therefore, water quality in the middle and lower segments of the Cape May aquifer was not evaluated. All well installation activities followed the procedures outlined in the ESI Project Plan and QAPP.

All the wells and piezometers on-site were developed to restore the natural hydraulic conductivity of the formation. Utilizing a centrifugal pump in the development process, JCA conducted development activities for the wells/piezometers in conjunction with installation. JCA personnel completed the task on June 16, 1993.

Versar monitored each development process and tested the groundwater with a pH meter, a conductivity meter, and a nephelometric turbidity unit (NTU) meter. Development was considered complete when pH and conductivity readings were relatively consistent and the turbidity of the groundwater was close to 100 NTUs. Only three of the well/piezometers were left above 100 NTUs, with their final NTU readings ranging from 112 (MW13-001) to 133 (MW20-001). Thirteen of the wells/piezometers developed to a clarity under 50 NTUs (Table 5.2). Appendix H contains the field development testing notes and documentation.

Wells/piezometers were developed to a point at which a minimum of three annulus and casing volumes were removed from each. Groundwater removed per well for development ranged from 75 gallons (MW11-002) to 440 gallons (MW20-001). Development

water for each well was stored temporarily on-site in 55-gallon DOT-approved drums, pending final disposal.

At a minimum of 14 days after development, the wells were purged and sampled (Table 5.3). Wells included in the sampling process included the 19 recently installed monitoring wells and three pre-existing off-site piezometers: DGW-03, along the western site boundary on the Penns Grove Project property; and EHW-12 and EHW-13, located along the northern PSF site boundary on the Pedricktown South property, just north of the north drainage swale. A dedicated disposable bailer was used for each well, for both purging and sampling.

Groundwater samples were collected from June 29 to July 7, 1993, and were submitted for quantitative analysis of VOCs, SVOCs, inorganics, explosive parameters (at selected locations only), and TPHCs, following strict chain-of-custody procedures. Collection, documentation, preservation and shipping of samples followed the protocol outlined in the ESI Project Plan and QAPP. Chemical analysis was completed by USAEC-certified ESE laboratories in Gainesville, Florida, and Denver, Colorado.

Elevations of the wells, piezometers, pre-existing wells, and surface water sampling points and staff gauges were surveyed based on the New Jersey State Planar Coordinates-NAD 27 grid system. James M. Stewart, Inc. of Philadelphia, Pennsylvania, completed the surveying on June 18, 1993. Wells/piezometers were surveyed with reference to mean sea level, at ground surface, at the north side of the top of PVC inner casing, and at the top of the protective outer steel casing to 0.01 feet.

Synoptic water level measurements were taken from the north side of the top of each PVC casing and at each surface water staff gauge to ±0.01 feet, using water level indicators. Measurements were taken on two separate occasions, at both high and low tide, on June 28 and on September 2, 1993. Elevation data are summarized in Tables 2.2 and 2.3 and are graphically depicted in Figures 2.9 and 2.10.

## 5.2 Groundwater Quality

Groundwater sampling was conducted at the PSF site to evaluate background groundwater quality, evaluate potential impacts to groundwater that have resulted from site-related activities, and assess potential groundwater transport pathways. Groundwater samples were collected from 19 on-site groundwater monitoring wells and

3 existing off-site groundwater monitoring wells to determine if site-related activities have affected groundwater quality.

Hydrogeological data collected during the investigation indicates that there is, at best, only an indirect hydraulic pathway between the off-site monitoring wells and site groundwater. Monitoring well DGW-03 is located on the opposite side of the slurry wall between the PSF site and the lake and therefore has no hydraulic connection to site groundwater. Monitoring wells EHW-12 and EHW-13 are located cross- or downgradient from the site on the north side of the drainage swale. Based on depths to groundwater and the screened depths of these wells, the drainage swale is believed to be intercepting the upper portion of the site groundwater flow before it reaches those well locations. Therefore, it is inappropriate to compare data from the on-site wells with off-site groundwater data.

5.2.1 Background Quality of Groundwater

In order to account for natural variability and regional influences on groundwater quality, background conditions were established through the sampling and analysis of three groundwater monitoring wells located hydraulically upgradient of potential on-site areas of concern. The locations of the background monitoring wells correspond to the locations of the background soil borings discussed in Section 4.1.1. Background groundwater samples were analyzed for SVOCs, VOCs, inorganic compounds, TPHCs, and explosive compounds.

No VOCs, SVOCs, or explosive compounds were detected in background groundwater samples. TPHCs were detected in one of the background samples, and a total of 20 inorganic compounds were detected. Lead, arsenic, aluminum, iron, magnesium, manganese, potassium, sodium, titanium, antimony, barium, chromium, cobalt, copper, vanadium, zinc, and calcium were detected in all three of the background samples. Beryllium and selenium were detected in one background sample, and nickel was detected in two samples.

To establish a baseline of comparison between site-related activities and background conditions, the average concentration of the background samples was calculated for each compound that was detected in at least one site-related groundwater sample. One half the detection limit was used for all sampling results less than the detection limit. A summary of background sampling results and calculated average background concentrations for groundwater is presented in Table 5.4.

### 5.2.2 Inorganic Compounds in Groundwater

Twenty-one inorganic compounds were detected in at least one sample collected from the 16 on-site monitoring wells and 3 off-site monitoring wells. Iron, magnesium, manganese, sodium, barium, and calcium were detected in 100 percent of the groundwater samples. Inorganic compounds detected at a lesser frequency include: lead (9 out of 19), arsenic (9 out of 19), selenium (6 out of 19), aluminum (16 out of 19), nickel (6 out of 19), potassium (17 out of 19), titanium (13 out of 19), antimony (5 out of 19), beryllium (1 out of 19), cadmium (1 out of 19), chromium (5 out of 19), cobalt (9 out of 19), copper (8 out of 19), vanadium (12 out of 19), and zinc (14 out of 19). Groundwater analytical results are summarized in Table 5.5 and statistical data are summarized in Table 5.6.

### 5.2.3 Organic Compounds in Groundwater

A limited number of organic compounds were detected in groundwater samples. PCE was detected in 2 wells, bis(2-ethylhexyl)phthalate was detected in 5 of the wells, and 1,2-dichlorobenzene was found in one well. Additionally, TPHCs were detected in 4 of the 19 wells sampled. Summaries of the analytical results and statistical data are provided in Tables 5.5 and 5.6, respectively.

### 5.2.4 Explosive Compounds in Groundwater

Analytical data for groundwater did not reveal the presence of any explosive compounds above laboratory detection limits.

### 5.2.5 Groundwater Data Comparison

To determine whether chemical concentrations in groundwater are attributable to site-related activities, each compound detected in at least one sample was compared to 2 times the average background concentration. The HRS recommends the comparison of data to 3 times background in order to determine if a release has occurred. For the purposes of this evaluation, sample results were compared to 2 times background as a more conservative estimate. Compounds that were determined to be in excess of 2 times background were further evaluated with respect to regulatory requirements. The NJDEPE recently promulgated *Ground Water Quality Standards* (N.J.A.C. 7:9-6). The regulations establish cleanup levels for groundwater that has the potential to affect a receptor. Table 5.7 summarizes the number of sampling locations exceeding two times background and the NJDEPE cleanup standards.

Of the compounds detected in at least one groundwater sample, potassium, barium, beryllium, and zinc were the only compounds that did not exceed the concentration of two times background. The only compounds detected in excess of two times background that also exceeded the NJDEPE cleanup standards were lead, arsenic, antimony, cadmium, chromium, and PCE. However, background concentrations also exceeded the NJDEPE criteria for each of these compounds except for chromium. Lead exceeded two times background and cleanup standards in MW16-002 and MW16-003, and arsenic exceeded both background and the standards in MW7-001 and EHW-12. The cadmium exceedance occurred in MW11-001. Chromium concentrations exceeded two times background and the standards in sample location MW16-002. Concentrations of antimony in excess of two times background and NJDEPE criteria were found in EHW-12, EHW-13, MW7-001, and MW16-002. Elevated levels of PCE were detected in MW11-001 and MW16-001. Hydraulic site data indicates that there is not a direct groundwater contaminant migration pathway from the site towards EHW-12 and EHW-13. Groundwater flow is interrupted by the north swale. Therefore, potential areas of concern at PSF, with respect to groundwater, include MW11-001, MW16-002, MW16-003, and MW7-001. These sampling locations were designed to evaluate the former scrap metal storage area (MW11-001), Building 422 USTs (MW16-002 and MW16-003), and the USTs adjacent to Building 177 and 179 (MW7-001). Elevated concentrations of metals in the vicinity of the former scrap metal storage area correlate with surface soil findings (e.g., elevated concentrations of cadmium were found in the surface soil and groundwater). However, most of the metals detected in surface soil in the scrap metal area were not found above regulatory levels in groundwater. The detection of arsenic in MW7-001 does not correlate well with other data findings. Although elevated levels of arsenic were sporadically detected in subsurface and surface soils throughout the site, it was not found in high concentrations in the vicinity of MW7-001. The concentration of PCE in the groundwater sampled from MW16-001 is believed to be attributable to the waste storage tank adjacent to Building 413.

### 5.3 Groundwater Modeling

Due to the potentially complicated groundwater flowpaths and numerous areas of concern at PSF, the ESI Project Plan made groundwater modeling requisite to completion of the investigation. The following factors were initially believed to exert possible influences on groundwater flow and contaminant transport:

- Surface water bodies contiguous with PSF, including the Penns Grove Project lake, the two drainage swales, and the nearby Delaware River;

- The presence of a buried 11,000 foot long slurry wall located west-northwest of PSF and the presence of the Pedricktown Dredged Materials Storage Areas located north and east of the PSF facility;

- A Pleistocene/Cretaceous unconformity underlying PSF which could place blanket sand aquifers of the Cape May formation in contact with the underlying lenticular Potomac-Raritan-Magothy sand aquifers; and

- A potentially diverse array of site contaminants including volatile and semi-volatile organic compounds, metals, petroleum hydrocarbons and explosive compounds, each having slightly different mobilities in subsurface transport, particularly in those areas where dissolved phase and separate phase components might co-exist in a groundwater contaminant plume.

As additional information on the parameters described above was obtained from PSF site monitoring wells and from the Philadelphia District ACOE files, the criteria for model selection became more apparent. The uppermost aquifer at PSF was determined to be the Pleistocene Cape May formation, an alluvial blanket sand aquifer that is unconfined. Correlation of PSF geologic data with boring logs from the Penns Grove Project and the Pedricktown Dredged Materials Storage Areas indicated that the uppermost aquifer was separated from the underlying Potomac-Raritan-Magothy aquifers by at least ten feet of clay at the Pleistocene/Cretaceous unconformity. The ACOE considered the degree of continuity of this clay broad enough locally to justify tying in an 11,000 foot long slurry wall to this surface to isolate the Penns Grove Project lake from contiguous aquifer segments. This project was undertaken to ensure that the emplacement of dredge spoils into the lake would have no water quality impacts on the neighboring areas.

In addition to groundwater flow in the Cape May aquifer being vertically constrained by clays associated with the underlying unconformity, the flow regime was also anticipated to be shallow for other reasons. Groundwater occurs at a depth of only 2-6 feet bgs, and the hydraulic gradient, which slopes to the north/northwest, appears to be controlled predominantly by the Delaware River. The river's channel, located approximately 0.75 miles north of PSF, truncates the entire 30+ feet thickness of Cape May aquifer. Therefore, most, if not all, groundwater flowpaths originating at PSF are ultimately terminated by exfiltration into the river. The nature of the basal Cape May formation contact and the surface/groundwater interrelationships observed at PSF both suggest that flow in this area is primarily horizontal.

Given this regional hydrogeologic setting, PSF and the contiguous area seemed well suited for the application of a two dimensional groundwater model. However, a decision also needed to be made regarding whether the model selected should be a groundwater flow and solute transport model or exclusively a flow model. After a review of ESI objectives and discussion with USAEC technical staff, it was decided that a two dimensional groundwater flowpath model with particle tracking capabilities would be adequate for ESI purposes. A subsequent review of preliminary analytical data from the sampling of PSF monitoring wells indicated that the primary AOCs at Pedricktown had not resulted in any significant impacts to groundwater. These results further supported the decision to eliminate solute transport modeling as part of the ESI.

### 5.3.1 Groundwater Model Description

FLOWPATH,™ the groundwater modeling software program selected for characterizing groundwater flow at PSF, is a combined finite-difference and particle tracking model for the complete analysis of two-dimensional groundwater flow and time related capture zones, the latter for use in delineating well head protection areas. The program can handle an unconfined water table or a confined aquifer with vertical leakage from over- and underlying aquitards, heterogeneous aquifer material properties, and spatially variable areal recharge and evapotranspiration. It accommodates surface water bodies, specified flux, and constant head conditions. Model output is in the form of hydraulic head distribution, velocity distribution, and particle pathline maps that may serve as a conservative predictor of solute transport patterns associated with known releases or contaminant sources.

### 5.3.2 FLOWPATH Input Parameters

<u>Grid and Wells:</u> For initial simulations, a 20 by 20 grid was selected. Although site features could not be characterized precisely on this 400 node grid, preliminary model assumptions could be tested quickly with a limited run time. In later trials, the grid density was increased to 56 by 50 to achieve more accuracy in the definition of aquifer boundaries and surface water bodies. Node spacing across the PSF site measures approximately 145 feet.

The FLOWPATH model accepts only injection and extraction wells in the program. Piezometers are represented as constant head locations but are not identified in the interior of the model domain. When the modeling program indicates a successful water balance has been achieved using the appropriate input parameters, the model is

considered complete and it can then be calibrated by comparing actual water table elevations (in the case of Pedricktown, from 24 groundwater level measurements and 3 surface water level measurements) to the hydraulic head distribution calculated by the model. This comparison is made by posting synoptic water level measurements from the site directly to the hydraulic head distribution map generated by the model.

Domain Boundaries and Surface Water Bodies: Model domain boundaries were selected as follows: A no-flow (impervious) boundary was set up to represent the slurry cut-off wall along the western side of PSF. Specified flux values of 0 and 0.67 gallons per day per square foot were used along the northeast and southwest domain boundaries, respectively. A specified flux value of zero was assumed for the northeast boundary because flow from preliminary hydrogeologic interpretations was considered to be parallel to this boundary. The value of 0.67 for the southwest boundary was calculated based on a hydraulic conductivity of 30 feet per day and an average hydraulic gradient of 0.003 feet per foot. A constant head boundary of 19 feet was input for the southeast model boundary based on the upgradient projection of PSF hydraulic head values, of which the maximum was 18.03 at MW21-001, in the southeastern portion of the facility.

The northwestern domain boundary is the Delaware River. Since all groundwater flowing north from PSF is believed to discharge into the river, this boundary was treated as a constant head boundary. Constant head values of -1.88 and 3.75 were assigned for low and high tide, respectively, based on surface water level measurements obtained June 28, 1993, from gauges installed on former dock pilings. The north swale was represented by surface water nodes with an average water depth of one foot and a leakage factor of 0.10 based on the presence of silts and clays observed in the channel bed material. All model input data is documented in the FLOWPATH logbook files presented in Appendix C.

Aquifer Properties: Aquifer thickness and hydraulic conductivities were input based on geotechnical data acquired from split-spoon sampling and slug testing conducted at PSF. Aquifer thickness is input by specifying the elevation of the base of the aquifer. The top of the aquifer is automatically calculated by the program as it reads the hydraulic head distribution data. An average aquifer thickness of 30 feet was entered for the Cape May formation in the vicinity of the PSF site. Hydraulic conductivities of 10 and 20 feet per day were input for the south and north portions of the PSF site, respectively. Default hydraulic conductivity values (K) for areas contiguous to PSF were placed at 30 feet per day.

Iterations for high and low tide hydraulic head distribution were also run using a higher hydraulic conductivity value for the entire model domain of 150 feet per day. The latter simulation was run for two reasons. First, hydraulic conductivities from PSF slug test data were considered possibly to be conservative due to the reasons discussed in this ESI report, Section 2.5.2.3. Second, a reasonable hydraulic head distribution could not be achieved at certain assumed aquifer recharge rates, without increasing K values above the slug test derived measurements. Either the measured slug test data is too conservative, or the areal recharge at PSF is much lower than predicted values.

Recharge: Model input for aquifer recharge via precipitation varied in the model domain relative to the location of the Pedricktown Dredged Materials Storage Area. In the first simulation (PSFMOD1L and PSFMOD1H, where default K = 30 feet per day), grid segments outside of the dredged materials storage area were assigned a recharge rate of approximately 0.7 feet per year, while the areas covered with dredged material were assigned no recharge. The latter assumption was based on personal communication with Mr. Tony DePasquale of the Philadelphia District ACOE, who indicated that the dredged materials consisted of silty sands and silts of low hydraulic conductivity, and it also took into account the overall thickness of these materials. In the second simulation (PSFMOD2L and PSFMOD2H, where default K = 150 feet per day), recharge for non-dredged material storage areas was input at 1.3 feet per year and at 0.5 feet per year in the dredged material storage areas.

Pathlines: Since no significant groundwater contaminant sources were identified at PSF during the ESI, particle tracking was performed by initiating pathlines at several abandoned UST locations. Although no releases are known to have occurred at any of these specific locations, the pathlines graphically demonstrate how the model can be employed to site additional monitoring wells and sampling stations for any UST Discharge Investigation Corrective Action Reports (DICARs) which may be required.

### 5.3.3 Groundwater Modeling Results

Four groundwater model simulations were performed, as follows:

Simulation 1

PSFMOD1L: Low tide, default K = 30 ft/day, 1 recharge rate (0.7 ft/year)

PSFMOD1H: High tide, default K = 30 ft/day, 1 recharge rate (0.7 ft/year)

Simulation 2

PSFMOD2L: Low tide, default K = 150 ft/day, 2 recharge rates (0.5 & 1.3 ft/year)

PSFMOD2H: High tide, default K = 150 ft/day, 2 recharge rates (0.5 & 1.3 ft/year)

PSFMOD1L and PSFMOD1H: The velocity distribution map (Figure 5.1) for PSFMOD1L gives a good perspective on how the 11,000 foot slurry wall located west of PSF affects groundwater flowpaths. The construction of this cut-off wall appears to have had a significant effect on both water table elevations and the direction of groundwater flow at PSF. Comparing present and historic (1958 and 1959 geotechnical boring data) water table elevations at PSF, we find water levels have risen approximately 10 feet. The convergence of velocity vectors at the drainage swale on the north side of PSF is an indication of the exfiltration of particles traveling in the upper portion of the aquifer to the swale. Volumetrically, however, exfiltration here is rather small (see Water Balance in Logbook for PSFMOD1L in Appendix C). Most particles in the aquifer track beneath the swale and continue until they enter the Delaware River. The pathline projections shown in Figure 5.2 were intentionally terminated near the drainage swale at the north PSF property line for two reasons: 1) petroleum hydrocarbon releases, particularly light, non-aqueous phase liquids (LNAPLs), are likely to travel at the soil/water interface and are therefore likely to enter the drainage swale where it intersects the water table; and 2) pathlines for dense, non-aqueous phase liquids (DNAPLs) would most likely behave differently from LNAPLs, bypassing the drainage swale and continuing in a north-northwesterly direction within the aquifer, beneath the Pedricktown South dredged materials.

The projection of pathlines between PSF and the Delaware River was unsuccessful. Inspection of pathline output in high and low tide simulations shows variable pathlines in this area. Since FLOWPATH predicts only steady state flow, transient flow (which is affected by the tidal cycles in the area nearest the Delaware River) would have to be simulated using a different modeling code. At present, there is little reason to perform such additional modeling since no significant contaminant plumes have been identified at the PSF site. Particle tracks in the area between PSF and the Delaware River are believed to be generally consistent with the flowpaths indicated in Figure 5.1. Tidal effects may cause actual flowpaths to be slightly different and velocities to be somewhat slower.

Both simulations produced good approximations of hydraulic head distributions, as is evident from inspection of the output shown in Appendix C. The hydraulic head distribution map (Figure 5.3) shows good correlation with observed hydraulic head

values. Agreement of hydraulic head data is better in the low tide simulation, but the differences observed in the high tide simulation are not deemed realistic. A comparison of low and high tide piezometric data (Table 2.2) indicates that at PSF, water level measurements were not affected by tidal cycles. It will be demonstrated later that at higher default K values for the aquifer, the impact of tidal cycles on hydraulic head distribution at PSF is reduced substantially.

This observation may also support the theory that slug test data from PSF slightly understated hydraulic conductivity values. With a K value of 30 feet per day, recharge had to be limited to 0.7 feet per year to obtain agreement between model derived and field hydraulic head distributions. In Simulation 2, accurate hydraulic head distributions were also achieved using a higher default K value, which allowed higher recharge rates to be input. These higher recharge rates are probably more realistic for the PSF area and suggest that the slug test derived K values calculated for PSF may be conservative. This observation is consistent with the data limitations (accuracy) associated with slug test methods. The margin of error is ± one order of magnitude.

PSFMOD2L and PSFMOD2H: Simulation 2 was run to determine whether the same hydraulic head distribution generated in Simulation 1 could be obtained at higher aquifer hydraulic conductivities and recharge rates. Simulation 2 model output essentially mirrored that of Simulation 1, with one exception. Hydraulic head distribution through high and low tidal cycles at PSF was not as variable in Simulation 2 as it was in Simulation 1. Therefore, Simulation 2 is more consistent with the actual water level measurements recorded at PSF, which remained constant through high and low tides. Simulation 2 also assumes an aquifer recharge volume which is more probable in an area receiving 37 inches of rainfall per year. Of the two simulations, the second is considered the most likely model solution at PSF. Hydraulic conductivities of 150 feet per day requisite to producing correct head distributions in Simulation 2 are probably closer to actual Cape May hydraulic conductivities than the slug test values obtained in the field.

#### 5.3.4 Model Calibration

Although Simulation 2 appeared to be the more likely solution for PSF, Simulation 1 was selected as the final model solution because input in this simulation was consistent with all documented field measurements. PSFMOD1L was calibrated by overlaying actual piezometric data on the model-generated hydraulic head distributions (Figure 5.3). Agreement between actual and calculated water table

measurements is considered good. Model derived hydraulic heads fall within 15% to 20% of actual field acquired piezometric data. Model water balance showed a -2.3% total mass balance error, which is probably the result of insufficient recharge input, resulting in excess domain outflow. The overall simulation results are believed to be within acceptable accuracy limits and should have good predictive value for any future groundwater management and monitoring objectives at PSF. As discussed earlier, off-site particle tracking is believed to occur in a direction towards the Delaware River, but it cannot be accurately projected due to groundwater flow variations between high and low tide in the area proximal to this surface water body. In the event that pathline analysis for off-site contaminant transport becomes necessary in the future, selection of a transient flow model will be necessary to define specific particle trajectories immediately prior to exfiltration into the river.

TABLE 5.1
MONITORING WELL CONSTRUCTION DETAILS
Pedricktown Support Facility
Salem County, New Jersey

| Well/ Piezometer Number | Date Installed | Elevation* at Grade | Elevation of PVC Casing | Total Well Depth (ft) | Depth to Top of Bentonite (ft) | Depth to Top of Sand Pack (ft) | Depth to Top of Screen (ft) | Diameter of Borehole (in) | Diameter of PVC Casing (in) | Screen Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| MW2-001 | 6-8-93 | 10.82 | 12.75 | 12.0 | 0.0 | 1.5 | 2.0 | 12 | 4 | 10 |
| MW7-001 | 6-7-93 | 17.18 | 19.32 | 11.5 | 0.0 | 1.0 | 1.5 | 8 | 4 | 10 |
| MW8-001 | 6-7-93 | 17.36 | 19.71 | 12.5 | 0.0 | 1.5 | 2.5 | 8 | 4 | 10 |
| MW10-001 | 6-8-93 | 13.09 | 15.05 | 12.0 | 0.0 | 1.5 | 2.0 | 12 | 4 | 10 |
| MW11-001 | 6-7-93 | 9.89 | 11.98 | 12.0 | 0.5 | 1.5 | 2.0 | 12 | 4 | 10 |
| MW11-002 | 6-8-93 | 11.33 | 13.42 | 12.5 | 0.0 | 2.0 | 2.5 | 8 | 4 | 10 |
| MW12-001 | 6-8-93 | 9.02 | 10.98 | 11.5 | 0.0 | 1.0 | 1.5 | 12 | 4 | 10 |
| MW12-002 | 6-9-93 | 10.34 | 12.37 | 11.5 | 0.0 | 1.0 | 1.5 | 12 | 4 | 10 |
| MW13-001 | 6-3-93 | 9.75 | 11.61 | 13.0 | 1.0 | 2.0 | 3.0 | 8 | 4 | 10 |
| MW14-001 | 6-8-93 | 9.19 | 11.25 | 11.5 | 0.0 | 1.0 | 1.5 | 8 | 4 | 10 |
| MW14-002 | 6-8-93 | 10.25 | 12.18 | 11.5 | 0.0 | 1.0 | 1.5 | 8 | 4 | 10 |
| MW15-001 | 6-8-93 | 13.31 | 15.29 | 12.5 | 0.0 | 1.5 | 2.5 | 8 | 4 | 10 |
| MW16-001 | 6-9-93 | 16.64 | 18.59 | 12.0 | 0.0 | 1.5 | 2.0 | 12 | 4 | 10 |
| MW16-002 | 6-4-93 | 14.11 | 16.11 | 12.0 | 0.0 | 1.5 | 2.0 | 8 | 4 | 10 |
| MW16-003 | 6-9-93 | 15.04 | 17.00 | 12.5 | 0.0 | 2.0 | 2.5 | 8 | 4 | 10 |
| MW20-001 | 6-3-93 | 21.03 | 23.16 | 13.6 | 1.0 | 2.2 | 3.6 | 8 | 4 | 10 |
| MW21-001 | 6-2-93 | 23.62 | 25.65 | 15.0 | 2.0 | 4.0 | 5.0 | 8 | 4 | 10 |
| MW22-001 | 6-9-93 | 18.95 | 21.08 | 12.5 | 0.0 | 2.0 | 2.5 | 8 | 4 | 10 |
| MW24-001 | 6-9-93 | 15.24 | 17.15 | 12.0 | 0.0 | 1.5 | 2.0 | 12 | 4 | 10 |
| P4-001 | 6-3-93 | 16.91 | 19.07 | 13.0 | 1.0 | 2.0 | 3.0 | 8 | 2 | 10 |
| P9-001 | 6-2-93 | 15.39 | 17.20 | 13.0 | 1.5 | 2.5 | 3.0 | 8 | 2 | 10 |
| P15-001 | 6-4-93 | 13.90 | 15.93 | 13.0 | 1.0 | 2.0 | 3.0 | 8 | 2 | 10 |

NOTE: All depths are measured from ground surface.
*Elevation data is the height in feet above mean sea level.

Table 5.2
MONITORING WELL DEVELOPMENT SUMMARY
Pedricktown Support Facility
Salem County, New Jersey

| Monitoring Well No. | pH | Conductivity (µOhm/cm) | NTU | Total Groundwater Removed (gals.) | Total Purging Time |
|---|---|---|---|---|---|
| MW2-001 | 5.5 | 210 | 51 | 165 | 1 Hr. 20 mins. |
| MW7-001 | 5.5 | 2200 | 130 | 110 | 2 Hrs. |
| MW8-001 | 5.0 | 200 | <50 | 130 | 1 Hr. |
| MW10-001 | 5.7 | 400 | 80 | 165 | 1 Hr. 15 mins. |
| MW11-001 | 8.35 | 160 | 22 | 165 | 1 Hr. |
| MW11-002 | 6.5 | 280 | 37 | 75 | 40 mins. |
| MW12-001 | 5.8 | 260 | 68 | 110 | 1 Hr. |
| MW12-002 | 6.5 | 180 | 20 | 165 | 1 Hr. 45 mins. |
| MW13-001 | 8.0 | 350 | 112 | 165 | 25 mins. |
| MW14-001 | 5.5 | 150 | 19.5 | 165 | 30 mins. |
| MW14-002 | 5.6 | 120 | 4 | 110 | 40 mins. |
| MW15-001 | 6.0 | 180 | 25 | 110 | 25 mins. |
| MW16-001 | 6.5 | 400 | 95 | 110 | 5 Hrs. 30 mins. |
| MW16-002 | 5.6 | 190 | 31 | 165 | 1 Hr. 30 mins. |
| MW16-003 | 6.0 | --- | 5 | 110 | 40 mins. |
| MW20-001 | 8.0 | 250 | 133 | 440 | 4 Hrs. 10 mins. |
| MW21-001 | 8.6 | 700 | 48 | 165 | 50 mins. |
| MW22-001 | 6.4 | 300 | 36.5 | 110 | 4 Hrs. |
| MW24-001 | 5.5 | 160 | 26 | 130 | 45 mins. |
| P4-001 | 8.2 | 940 | 91 | 110 | 1 Hr. 10 mins. |
| P9-001 | 6.5 | 275 | 60 | 85 | 1 Hr. 15 mins. |
| P15-001 | 7.6 | 182 | 44 | 110 | 30 mins. |

Legend:

µOhm/cm = micro Ohms per centimeter
NTU = nephelometric turbidity unit
gals. = gallons
Hr.(s) = Hour(s)
mins. = minutes

Table 5.3
MONITORING WELL SAMPLING SUMMARY
Pedricktown Support Facility
Salem County, New Jersey

| Monitoring Well No. | pH* | Conductivity* (µOhm/cm) | Date Sampled | Total Gallons of Groundwater Purged |
|---|---|---|---|---|
| MW2-001 | 5.28 | 190 | 7/2/93 | 31 |
| MW7-001 | 4.80 | 2600 | 7/1/93 | 28 |
| MW8-001 | --- | --- | 7/1/93 | 28 |
| MW10-001 | 5.42 | 440 | 7/2/93 | 28 |
| MW11-001 | 5.20 | 200 | 7/1/93 | 29 |
| MW11-002 | 5.68 | 280 | 7/1/93 | 28.5 |
| MW12-001 | 7.06 | 198 | 7/6/93 | 27 |
| MW12-002 | --- | 190 | 7/2/93 | 26 |
| MW13-001 | --- | --- | 7/6/93 | 28 |
| MW14-001 | 6.18 | 160 | 7/2/93 | 31 |
| MW14-002 | 5.23 | 120 | 7/2/93 | 30 |
| MW15-001 | --- | --- | 7/2/93 | 27 |
| MW16-001 | --- | 320 | 7/2/93 | 22 |
| MW16-002 | --- | --- | 7/1/93 | 35 |
| MW16-003 | --- | 260 | 7/2/93 | 22 |
| MW20-001 | --- | --- | 7/1/93 | 30 |
| MW21-001 | --- | --- | 7/1/93 | 31 |
| MW22-001 | --- | --- | 7/1/93 | 35 |
| MW24-001 | 6.00 | 220 | 7/2/93 | 26 |
| DGW3-001 | 7.56 | 222 | 7/6/93 | 60 |
| EHW-12 | 6.21 | 3130 | 7/6/93 | 74 |
| EHW-13 | 5.96 | 2690 | 7/7/93 | 135 |

µOhm/cm - micro Ohms per centimeter

* During sampling activities, Versar's pH and conductivity probes encountered mechanical difficulties and readings could not be taken for certain monitoring wells. These wells are designated above by dashes in corresponding pH and conductivity locations. Versar repaired the problems in the field, and measured the parameters in the remaining monitoring wells.

TABLE 5.4
GROUNDWATER BACKGROUND ANALYTICAL RESULTS (ppb)

| PARAMETER | MW20-001 01-JUL-93 | | MW21-001 01-JUL-93 | | MW22-001 01-JUL-93 | | AVERAGE BACKGROUND CONCENTRATION | 2 X AVERAGE BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 211 | LT | 200 | LT | 200 | 137.00 | 274.00 |
| Lead | | 25.6 | | 13 | | 5.94 | 14.85 | 29.69 |
| Arsenic | | 10.2 | | 8.93 | | 2.67 | 7.27 | 14.53 |
| Selenium | LT | 2.54 | | 13.8 | LT | 2.54 | 5.45 | 10.89 |
| Aluminum | | 31000 | | 16000 | | 12000 | 19666.67 | 39333.33 |
| Iron | | 28000 | | 28000 | | 21000 | 25666.67 | 51333.33 |
| Magnesium | | 9300 | | 11000 | | 11000 | 10433.33 | 20866.67 |
| Manganese | | 248 | | 395 | | 1370 | 671.00 | 1342.00 |
| Nickel | | 45.8 | LT | 23.3 | | 31.3 | 29.58 | 59.17 |
| Potassium | | 7100 | | 7660 | | 8390 | 7716.67 | 15433.33 |
| Sodium | | 6040 | | 20000 | | 15000 | 13680.00 | 27360.00 |
| Titanium | | 455 | | 429 | | 294 | 392.67 | 785.33 |
| Antimony | | 32.9 | | 26.9 | | 37.8 | 32.53 | 65.07 |
| Barium | | 214 | | 102 | | 89.6 | 135.20 | 270.40 |
| Beryllium | | 2.91 | LT | 2 | LT | 2 | 1.64 | 3.27 |
| Cadmium | LT | 5 | LT | 5 | LT | 5 | 2.50 | 5.00 |
| Chromium | | 74.2 | | 25.1 | | 32 | 43.77 | 87.53 |
| Cobalt | | 13.6 | | 13.9 | | 37.1 | 21.53 | 43.07 |
| Copper | | 49.7 | | 17.1 | | 19.8 | 28.87 | 57.73 |
| Vanadium | | 87.9 | | 47.5 | | 36.3 | 57.23 | 114.47 |
| Zinc | | 199 | | 58 | | 62.8 | 106.60 | 213.20 |
| Calcium | | 13000 | | 16000 | | 17000 | 15333.33 | 30666.67 |
| Tetrachloroethylene | LT | 2 | LT | 2 | LT | 2 | 1.00 | 2.00 |

TABLE 5.4 (continued)
GROUNDWATER BACKGROUND ANALYTICAL RESULTS (ppb)

| PARAMETER | MW20-001 01-JUL-93 | | MW21-001 01-JUL-93 | | MW22-001 01-JUL-93 | | AVERAGE BACKGROUND CONCENTRATION | 2 X AVERAGE BACKGROUND CONCENTRATION |
|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | LT | 1 | LT | 1 | LT | 1 | 0.50 | 1.00 |
| 1,2-Dichlorobenzene | LT | 1 | LT | 1 | LT | 1 | 0.50 | 1.00 |

ppb = parts per billion or ug/l
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 5.5
GROUNDWATER ANALYTICAL RESULTS (ppb)

| PARAMETER | DGW-03 06-JUL-93 | | EHW-12 06-JUL-93 | | EHW-13 07-JUL-93 | | MW2-001 02-JUL-93 | | MW7-001 01-JUL-93 | | MW8-001 01-JUL-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | | 287 | | 257 | | 533 | LT | 200 | | 257 | LT | 200 |
| Lead | LT | 4.54 | LT | 4.54 | LT | 4.54 | | 6.9 | | 14.1 | | 20 |
| Arsenic | LT | 2 | | 17.7 | | 3.83 | LT | 2 | | 18.2 | | 5.72 |
| Selenium | LT | 2.54 | LT | 2.54 | LT | 2.54 | LT | 2.54 | | 13.6 | | 3.4 |
| Aluminum | | 1020 | LT | 200 | LT | 200 | | 1950 | | 36000 | | 18000 |
| Iron | | 464 | | 120000 | | 60000 | | 2590 | | 340000 | | 18000 |
| Magnesium | | 9600 | | 170000 | | 110000 | | 5330 | | 120000 | | 5150 |
| Manganese | | 119 | | 55000 | | 46000 | | 112 | | 38000 | | 916 |
| Nickel | LT | 23.3 | LT | 23.3 | | 25.1 | LT | 23.3 | | 62.9 | LT | 23.3 |
| Potassium | | 2980 | | 8150 | LT | 22000 | | 2890 | LT | 16000 | | 4740 |
| Sodium | | 9140 | | 84000 | | 99000 | | 6480 | | 120000 | | 18000 |
| Titanium | LT | 10 | LT | 10 | LT | 10 | | 41.3 | | 842 | | 381 |
| Antimony | LT | 25.1 | | 120 | | 87.5 | LT | 25.1 | | 310 | LT | 25.1 |
| Barium | | 51 | | 21.7 | | 19.6 | | 63.6 | | 101 | | 112 |
| Beryllium | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |
| Cadmium | LT | 5 | LT | 5 | LT | 5 | LT | 5 | LT | 5 | LT | 5 |
| Chromium | LT | 22.4 | LT | 22.4 | LT | 22.4 | LT | 22.4 | | 80.5 | | 32.5 |
| Cobalt | LT | 10.8 | | 81.3 | | 50.5 | LT | 10.8 | | 107 | | 17.4 |
| Copper | LT | 10 | LT | 10 | | 96.8 | | 11.1 | | 42.5 | | 14.7 |
| Vanadium | LT | 7.62 | | 12.3 | | 9 | | 12.2 | | 255 | | 44.5 |
| Zinc | LT | 20 | | 43 | | 184 | | 24.3 | | 168 | | 73.3 |
| Calcium | | 11000 | | 320000 | | 220000 | | 12000 | | 150000 | | 16000 |
| Tetrachloroethylene | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |
| Bis(2-ethylhexyl) phthalate | LT | 1 | LT | 1 | LT | 1 | LT | 1 | | 1.1 | LT | 1 |
| 1,2-Dichlorobenzene | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | | 1.3 |

TABLE 5.5 (continued)
GROUNDWATER ANALYTICAL RESULTS (ppb)

| PARAMETER | MW10-001 02-JUL-93 | | MW11-001 01-JUL-93 | | MW11-002 01-JUL-93 | | MW12-001 06-JUL-93 | | MW12-002 02-JUL-93 | | MW13-001 06-JUL-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 200 | LT | 200 | LT | 200 | LT | 200 | LT | 200 | LT | 200 |
| Lead | | 6.02 | LT | 4.54 | | 12.3 | LT | 4.54 | | 12.9 | LT | 4.54 |
| Arsenic | | 3.88 | LT | 2 | | 2.7 | LT | 2 | | 4.23 | LT | 2 |
| Selenium | LT | 2.54 | LT | 2.54 | | 4.58 | LT | 2.54 | | 4.29 | LT | 2.54 |
| Aluminum | | 3330 | | 525 | | 8800 | | 509 | | 5820 | | 228 |
| Iron | | 9100 | | 880 | | 12000 | | 1070 | | 7670 | | 376 |
| Magnesium | | 3890 | | 3060 | | 3140 | | 3850 | | 4310 | | 4900 |
| Manganese | | 180 | | 286 | | 1650 | | 194 | | 97.5 | | 1490 |
| Nickel | | 26.5 | LT | 23.3 | LT | 23.3 | LT | 23.3 | LT | 23.3 | LT | 23.3 |
| Potassium | | 4550 | | 4480 | | 3640 | | 4500 | | 5530 | | 5270 |
| Sodium | | 42000 | | 5880 | | 24000 | | 3420 | | 4900 | | 5670 |
| Titanium | | 84.7 | | 11.1 | | 209 | | 16 | | 141 | LT | 10 |
| Antimony | LT | 25.1 | LT | 25.1 | LT | 25.1 | LT | 25.1 | LT | 25.1 | LT | 25.1 |
| Barium | | 46 | | 69.1 | | 46 | | 29.2 | | 47.3 | | 35.6 |
| Beryllium | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |
| Cadmium | LT | 5 | | 9.62 | LT | 5 | LT | 5 | LT | 5 | LT | 5 |
| Chromium | LT | 22.4 | LT | 22.4 | | 24 | LT | 22.4 | LT | 22.4 | LT | 22.4 |
| Cobalt | LT | 10.8 | LT | 10.8 | | 22.7 | LT | 10.8 | LT | 10.8 | LT | 10.8 |
| Copper | LT | 10 | LT | 10 | | 20.7 | LT | 10 | | 11.1 | LT | 10 |
| Vanadium | | 17.8 | | 9.55 | | 25.4 | LT | 7.62 | | 18.2 | LT | 7.62 |
| Zinc | | 31.2 | | 103 | | 53.8 | | 24.3 | | 49.1 | | 43.3 |
| Calcium | | 29000 | | 18000 | | 16000 | | 20000 | | 20000 | | 21000 |
| Tetrachloroethylene | LT | 2 | | 7.4 | LT | 2 | LT | 2 | LT | 2 | LT | 2 |
| Bis(2-ethylhexyl) phthalate | | 0.92 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |
| 1,2-Dichlorobenzene | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |

TABLE 5.5 (continued)
GROUNDWATER ANALYTICAL RESULTS (ppb)

| PARAMETER | MW14-001 02-JUL-93 | | MW14-002 02-JUL-93 | | MW15-001 02-JUL-93 | | MW16-001 02-JUL-93 | | MW16-002 01-JUL-93 | | MW16-003 02-JUL-93 | | MW24-001 02-JUL-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | LT | 200 | LT | 200 | LT | 200 | LT | 200 | LT | 200 | LT | 200 | LT | 200 |
| Lead | LT | 4.54 | LT | 4.54 | LT | 4.54 | LT | 4.54 | | 46.3 | | 31.3 | | 4.99 |
| Arsenic | LT | 2 | LT | 2 | LT | 2 | LT | 2 | | 10.1 | | 10.8 | LT | 2 |
| Selenium | LT | 2.54 | LT | 2.54 | LT | 2.54 | | 3.08 | LT | 2.54 | | 5.23 | LT | 2.54 |
| Aluminum | | 412 | | 1090 | LT | 200 | | 3200 | | 65000 | | 19000 | | 1030 |
| Iron | | 996 | | 1380 | | 132 | | 4210 | | 140000 | | 32000 | | 1560 |
| Magnesium | | 3600 | | 2050 | | 2720 | | 7080 | | 11000 | | 7360 | | 5640 |
| Manganese | | 391 | | 168 | | 71.1 | | 637 | | 1730 | | 2520 | | 1110 |
| Nickel | LT | 23.3 | LT | 23.3 | LT | 23.3 | | 43 | | 64.5 | | 29.2 | LT | 23.3 |
| Potassium | | 3550 | | 3350 | | 3310 | | 5090 | | 8940 | | 6090 | | 2580 |
| Sodium | | 3330 | | 2680 | | 2440 | | 16000 | | 9920 | | 6360 | | 6670 |
| Titanium | LT | 10 | | 12.5 | LT | 10 | | 79.7 | | 1150 | | 508 | | 11.1 |
| Antimony | LT | 25.1 | LT | 25.1 | LT | 25.1 | LT | 25.1 | | 106 | | 42.7 | LT | 25.1 |
| Barium | | 36.2 | | 30.7 | | 21.3 | | 46 | | 261 | | 113 | | 38.4 |
| Beryllium | LT | 2 | LT | 2 | LT | 2 | LT | 2 | | 3.19 | LT | 2 | LT | 2 |
| Cadmium | LT | 5 | LT | 5 | LT | 5 | LT | 5 | LT | 5 | LT | 5 | LT | 5 |
| Chromium | LT | 22.4 | LT | 22.4 | LT | 22.4 | LT | 22.4 | | 150 | | 36.3 | LT | 22.4 |
| Cobalt | LT | 10.8 | LT | 10.8 | LT | 10.8 | | 12.2 | | 59.6 | | 29.7 | | 16.1 |
| Copper | LT | 10 | LT | 10 | LT | 10 | LT | 10 | | 89.2 | | 26.3 | LT | 10 |
| Vanadium | LT | 7.62 | LT | 7.62 | LT | 7.62 | | 13.4 | | 193 | | 80.9 | LT | 7.62 |
| Zinc | LT | 20 | LT | 20 | LT | 20 | | 39.3 | | 211 | | 123 | LT | 20 |
| Calcium | | 14000 | | 9100 | | 24000 | | 23000 | | 26000 | | 28000 | | 13000 |
| Tetrachloroethylene | LT | 2 | LT | 2 | LT | 2 | | 26 | LT | 2 | LT | 2 | LT | 2 |

TABLE 5.5 (continued)
GROUNDWATER ANALYTICAL RESULTS (ppb)

| PARAMETER | MW14-001 02-JUL-93 | | MW14-002 02-JUL-93 | | MW15-001 02-JUL-93 | | MW16-001 02-JUL-93 | | MW16-002 01-JUL-93 | | MW16-003 02-JUL-93 | | MW24-001 02-JUL-93 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | | 1.3 | | 0.96 | LT | 1 | LT | 1 | LT | 1 | | 1.1 | LT | 1 |
| 1,2-Dichlorobenzene | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 | LT | 1 |

ppb = parts per billion or ug/l
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 5.6
STATISTICAL EVALUATION OF GROUNDWATER SAMPLES (ppb)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION | STANDARD DEVIATION |
|---|---|---|---|---|---|
| Total petroleum hydrocarbons | 4 /19 | 21 | 149.16 | 533 | 109.02 |
| Lead | 9 /19 | 47 | 9.34 | 46.3 | 11.57 |
| Arsenic | 9 /19 | 47 | 4.59 | 18.2 | 5.43 |
| Selenium | 6 /19 | 32 | 2.67 | 13.6 | 2.89 |
| Aluminum | 16 /19 | 84 | 8748.11 | 65000 | 16046.74 |
| Iron | 19 /19 | 100 | 39601.47 | 340000 | 81132.91 |
| Magnesium | 19 /19 | 100 | 25404.21 | 170000 | 47935.49 |
| Manganese | 19 /19 | 100 | 7930.08 | 55000 | 16869.93 |
| Nickel | 6 /19 | 32 | 21.19 | 64.5 | 16.83 |
| Potassium | 17 /19 | 89 | 5191.58 | 8940 | 2247.91 |
| Sodium | 19 /19 | 100 | 24731.05 | 120000 | 34786.31 |
| Titanium | 13 /19 | 68 | 185.13 | 1150 | 313.14 |
| Antimony | 5 /19 | 26 | 44.31 | 310 | 71.12 |
| Barium | 19 /19 | 100 | 62.56 | 261 | 54.50 |
| Beryllium | 1 /19 | 5 | 1.12 | 3.19 | 0.49 |
| Cadmium | 1 /19 | 5 | 2.87 | 9.62 | 1.59 |
| Chromium | 5 /19 | 26 | 25.27 | 150 | 33.68 |
| Cobalt | 9 /19 | 47 | 23.71 | 107 | 28.91 |
| Copper | 8 /19 | 42 | 19.34 | 96.8 | 27.03 |
| Vanadium | 12 /19 | 63 | 37.79 | 255 | 67.17 |
| Zinc | 14 /19 | 74 | 64.24 | 211 | 61.78 |
| Calcium | 19 /19 | 100 | 52110.53 | 320000 | 82046.58 |
| Tetrachloroethylene | 2 /19 | 11 | 2.65 | 26 | 5.69 |

TABLE 5.6 (continued)
STATISTICAL EVALUATION OF GROUNDWATER SAMPLES (ppb)

| PARAMETER | FREQUENCY OF DETECTION | PERCENTAGE DETECTED (%) | AVERAGE CONCENTRATION | MAXIMUM DETECTED CONCENTRATION | STANDARD DEVIATION |
|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 5 /19 | 26 | 0.65 | 1.3 | 0.26 |
| 1,2-Dichlorobenzene | 1 /19 | 5 | 0.54 | 1.3 | 0.18 |

ppb = parts per billion or ug/l
LT = Less than laboratory-certified detection limit
Note: Table includes only those parameters detected above laboratory-certified detection limits.

TABLE 5.7
GROUNDWATER DATA COMPARISON (ppb)

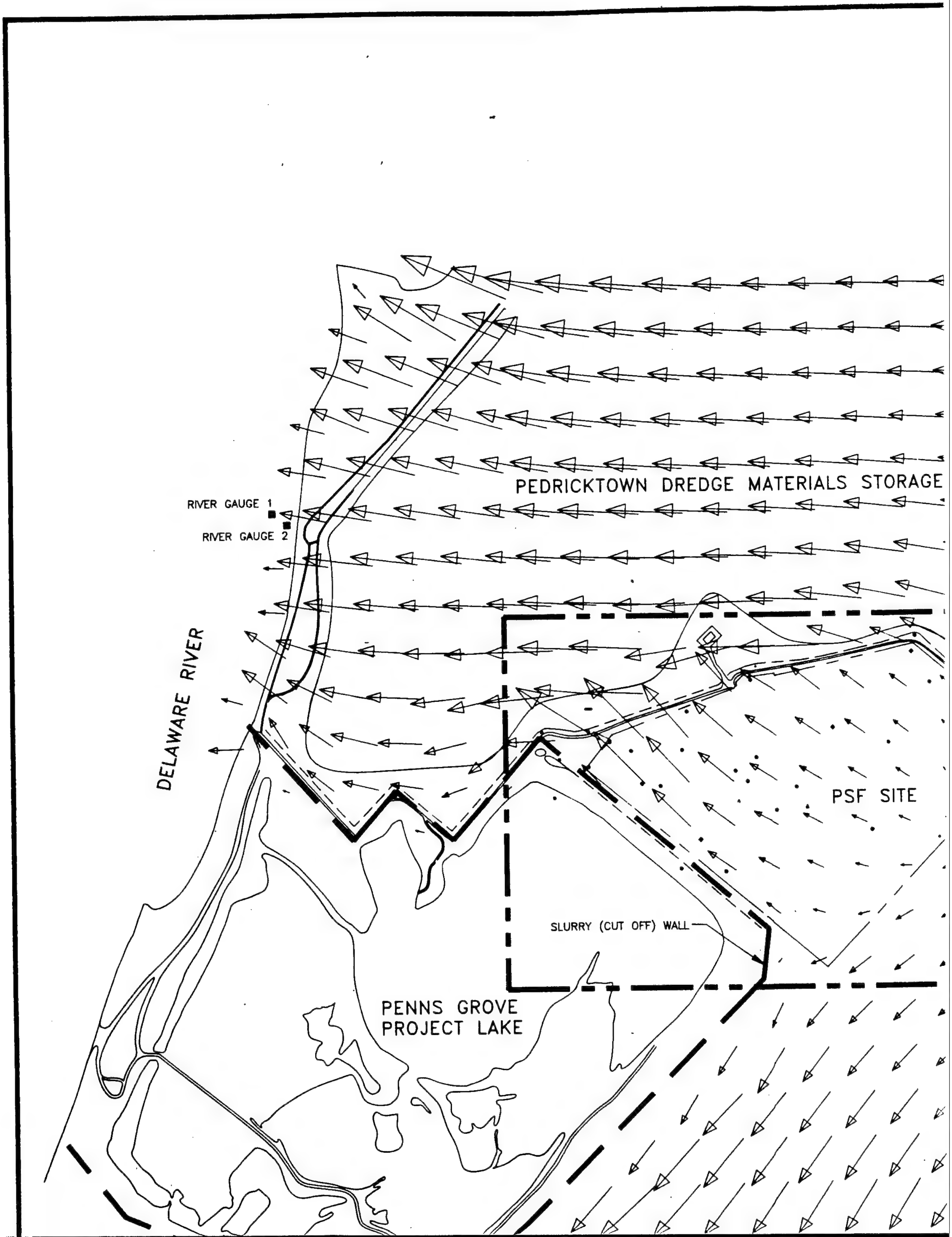
| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEDING NJDEPE CRITERIA[b] |
|---|---|---|---|---|---|---|
| Total petroleum hydrocarbons | 149.16 | 533 | 274.00 | 2 | 1000 | 0 |
| Lead | 9.34 | 46.3 | 29.69 | 2 | 10 | 2[c] |
| Arsenic | 4.59 | 18.2 | 14.53 | 2 | 8 | 2[c] |
| Selenium | 2.67 | 13.6 | 10.89 | 1 | 50 | 0 |
| Aluminum | 8748.11 | 65000 | 39333.33 | 1 | * | N/A |
| Iron | 39601.47 | 340000 | 51333.33 | 4 | * | N/A |
| Magnesium | 25404.21 | 170000 | 20866.67 | 3 | * | N/A |
| Manganese | 7930.08 | 55000 | 1342.00 | 6 | * | N/A |
| Nickel | 21.19 | 64.5 | 59.17 | 2 | 100 | 0 |
| Potassium | 5191.58 | 8940 | 15433.33 | 0 | * | N/A |
| Sodium | 24731.05 | 120000 | 27360.00 | 4 | * | N/A |
| Titanium | 185.13 | 1150 | 785.33 | 2 | * | N/A |
| Antimony | 44.31 | 310 | 65.07 | 4 | 20 | 4[c] |
| Barium | 62.56 | 261 | 270.40 | 0 | 2000 | N/A |
| Beryllium | 1.12 | 3.19 | 3.27 | 0 | 20 | N/A |
| Cadmium | 2.87 | 9.62 | 5.00 | 1 | 4 | 1[c] |
| Chromium | 25.27 | 150 | 87.53 | 1 | 100 | 1 |
| Cobalt | 23.71 | 107 | 43.07 | 4 | * | N/A |
| Copper | 19.34 | 96.8 | 57.73 | 2 | * | N/A |
| Vanadium | 37.79 | 255 | 114.47 | 2 | * | N/A |
| Zinc | 64.24 | 211 | 213.20 | 0 | 5000 | N/A |
| Calcium | 52110.53 | 320000 | 30666.67 | 3 | * | N/A |
| Tetrachloroethylene | 2.65 | 26 | 2.00 | 2 | 1 | 2 |

TABLE 5.7 (continued)
GROUNDWATER DATA COMPARISON (ppb)

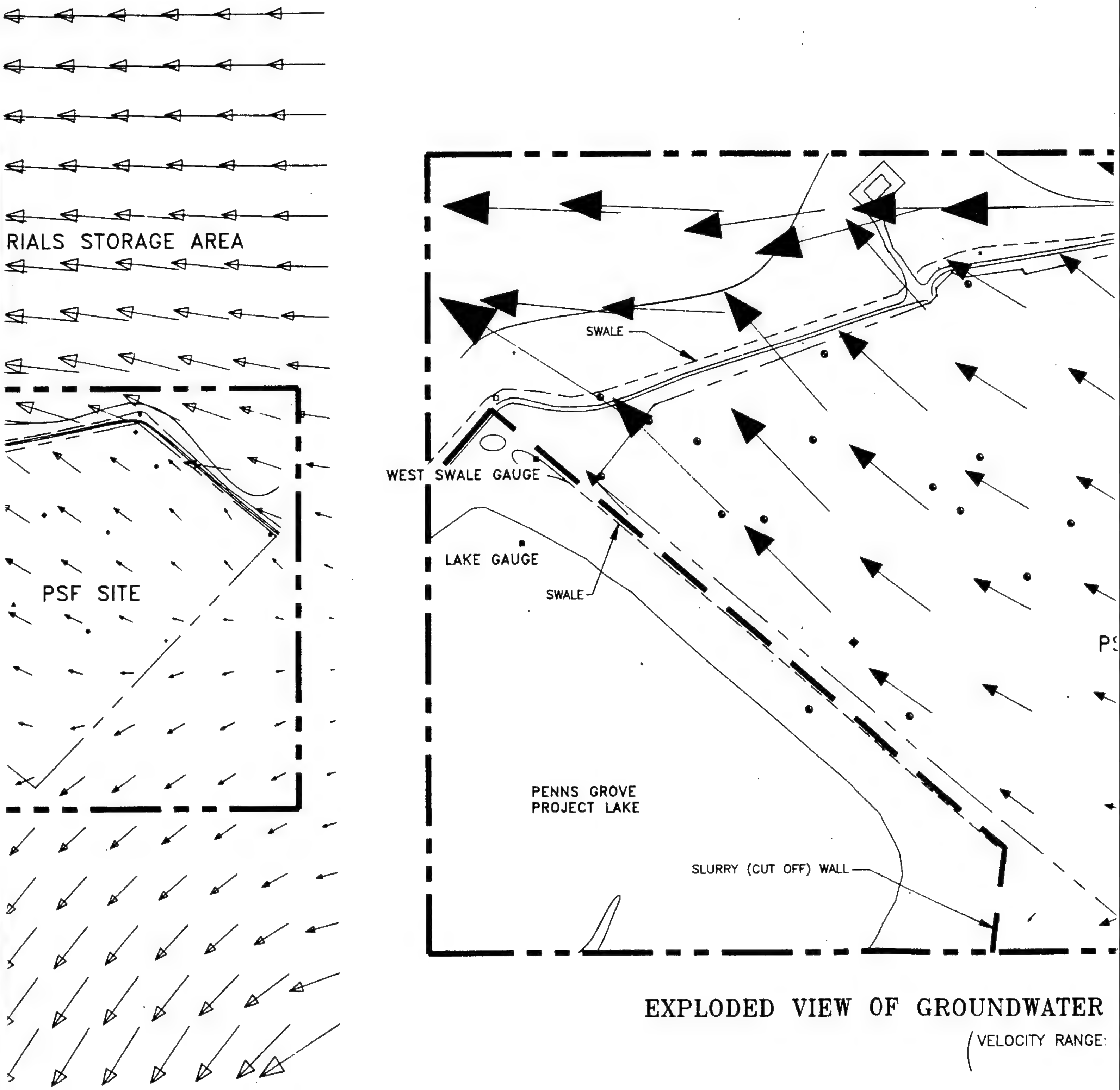
| PARAMETER | AVERAGE CONCENTRATION | MAXIMUM CONCENTRATION DETECTED | AVERAGE 2 X BACKGROUND CONCENTRATION | NUMBER OF SAMPLES EXCEEDING BACKGROUND | NJDEPE CLEANUP CRITERIA[a] | NUMBER OF SAMPLES EXCEDING NJDEPE CRITERIA[b] |
|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 0.65 | 1.3 | 1.00 | 2 | 30 | 0 |
| 1,2-Dichlorobenzene | 0.54 | 1.3 | 1.00 | 1 | 600 | 0 |

a. NJDEPE Proposed Cleanup Standards for Contaminated Sites
b. Comparison to Cleanup Criteria Conducted for Data Points in Excess of 2 Times Background
c. Laboratory detection limit exceeds cleanup criteria
* = No standard available
ppb = parts per billion or ug/l

(1)


PEDRICKTOWN DREDGE MATERIALS STORAGE
RIVER GAUGE 1
RIVER GAUGE 2
DELAWARE RIVER
PSF SITE
SLURRY (CUT OFF) WALL
PENNS GROVE
PROJECT LAKE

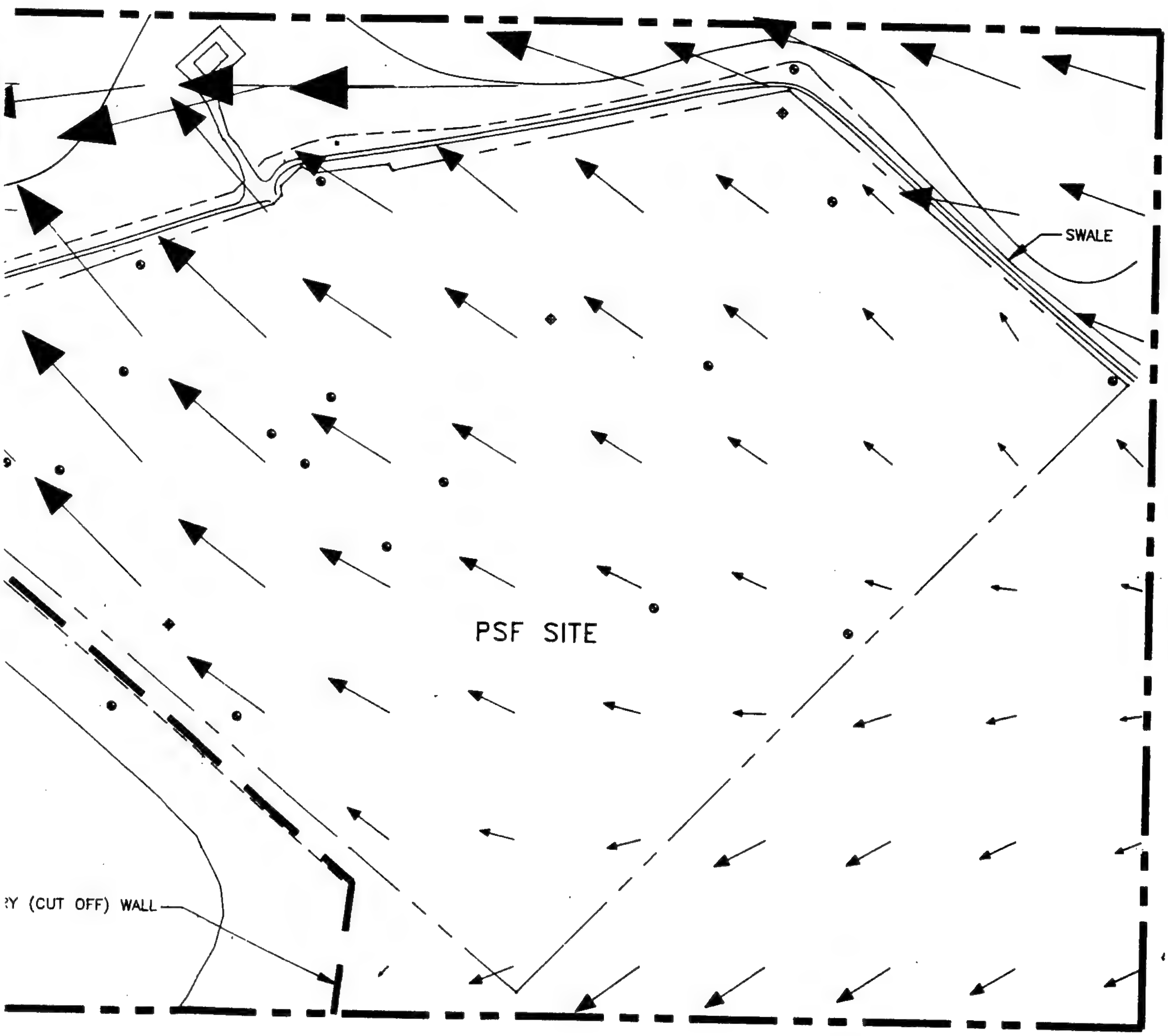
②




EXPLODED VIEW OF GROUNDWATER

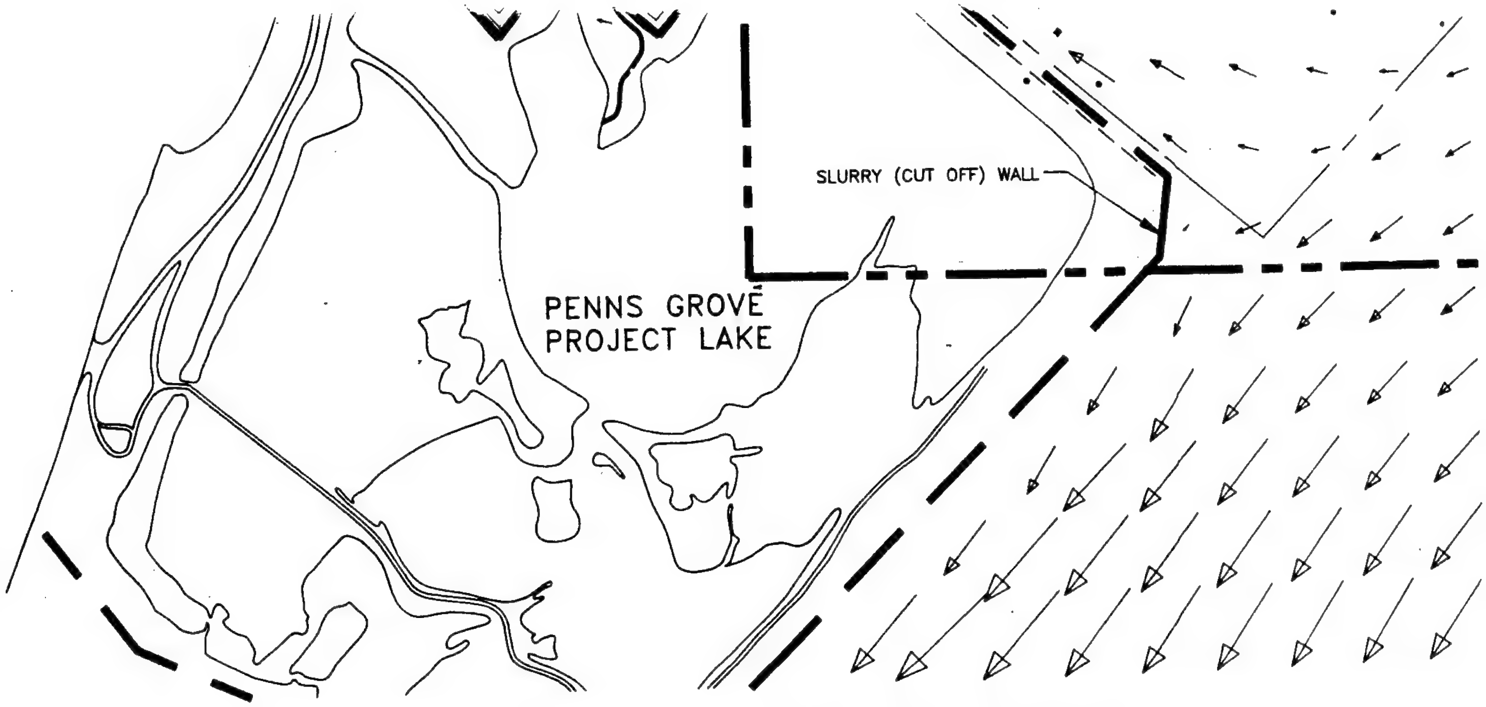
(VELOCITY RANGE:

③




# )ED VIEW OF GROUNDWATER VELOCITY DISTRIBUTIONS AT PSF

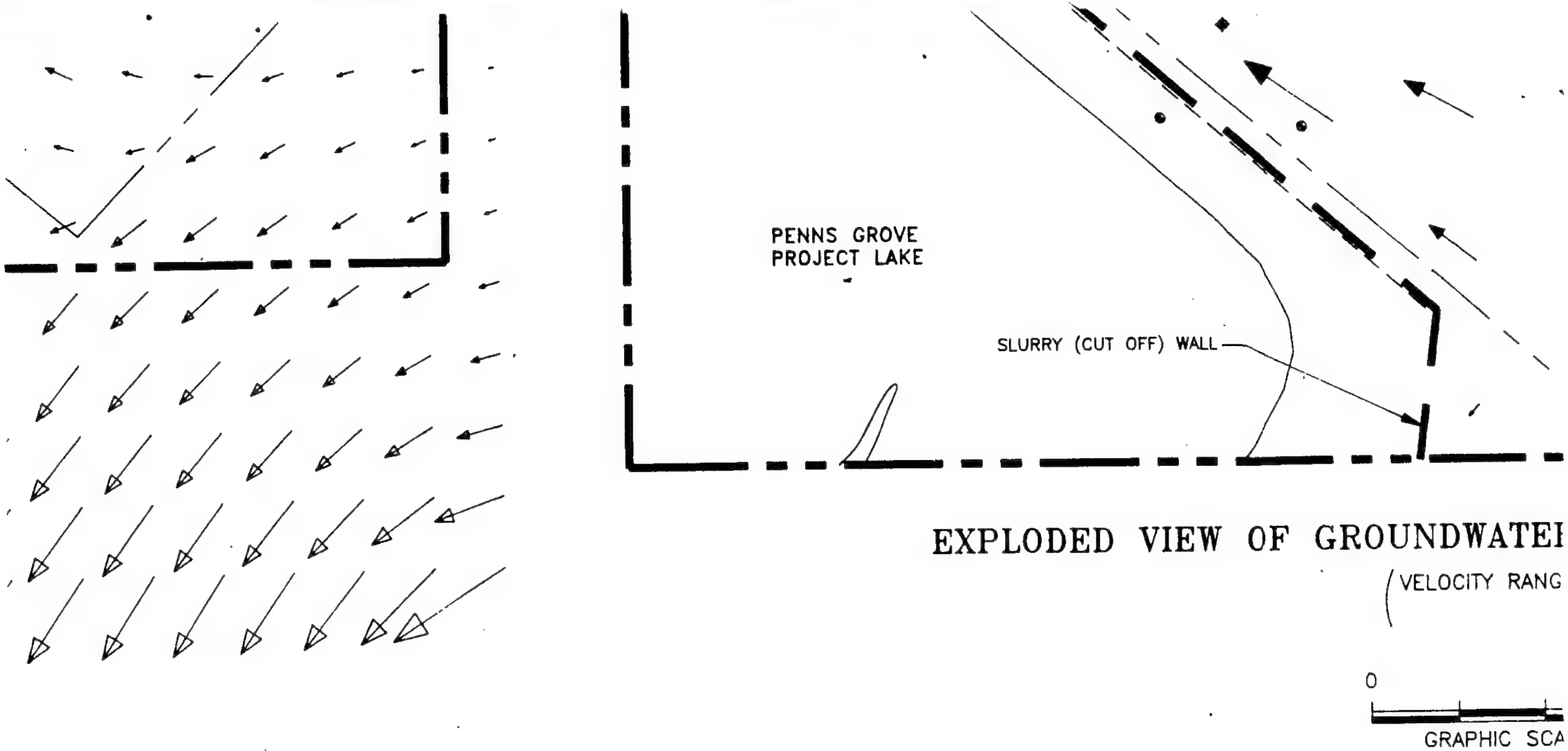
(VELOCITY RANGE: AVG. = 0.18 FT/DAY
MAX. = 0.71 FT/DAY)




FLOWPATH® GENERATED GROUNDWATER VELOCITY DISTRIBUTION
FOR PSF AND CONTIGUOUS AREA
(PSFMOD1L)

0 600'

GRAPHIC SCALE

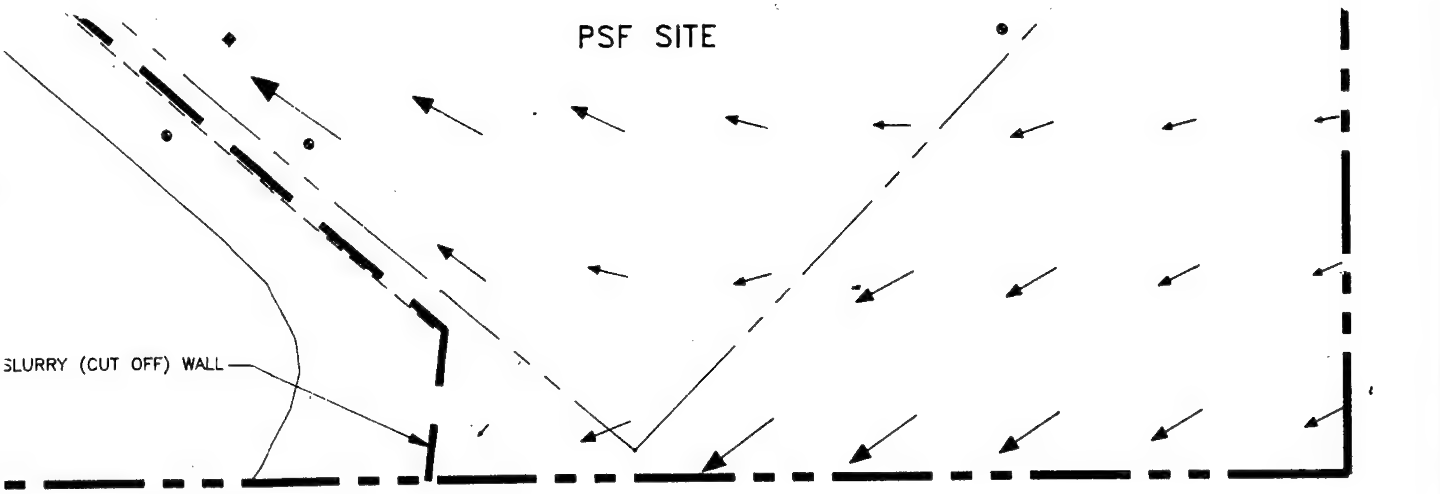



EXPLODED VIEW OF GROUNDWATEI

(VELOCITY RANG

**NOTE:**

VECTORS INDICATE DIRECTION AND RELATIVE MAGNITUDE OF GROUNDWATER FLOW.




LODED VIEW OF GROUNDWATER VELOCITY DISTRIBUTIONS AT PSF

(VELOCITY RANGE: AVG. = 0.18 FT/DAY
MAX. = 0.71 FT/DAY)

0 600'

GRAPHIC SCALE

**NOTE:**

VECTORS INDICATE DIRECTION AND RELATIVE MAGNITUDE OF GROUNDWATER FLOW.

| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED ASHTON | DATE 09/14/93 | |
| DRAWN KEMLER | 09/22/93 | |
| CHECKED MORGANELLI | 09/30/93 | |

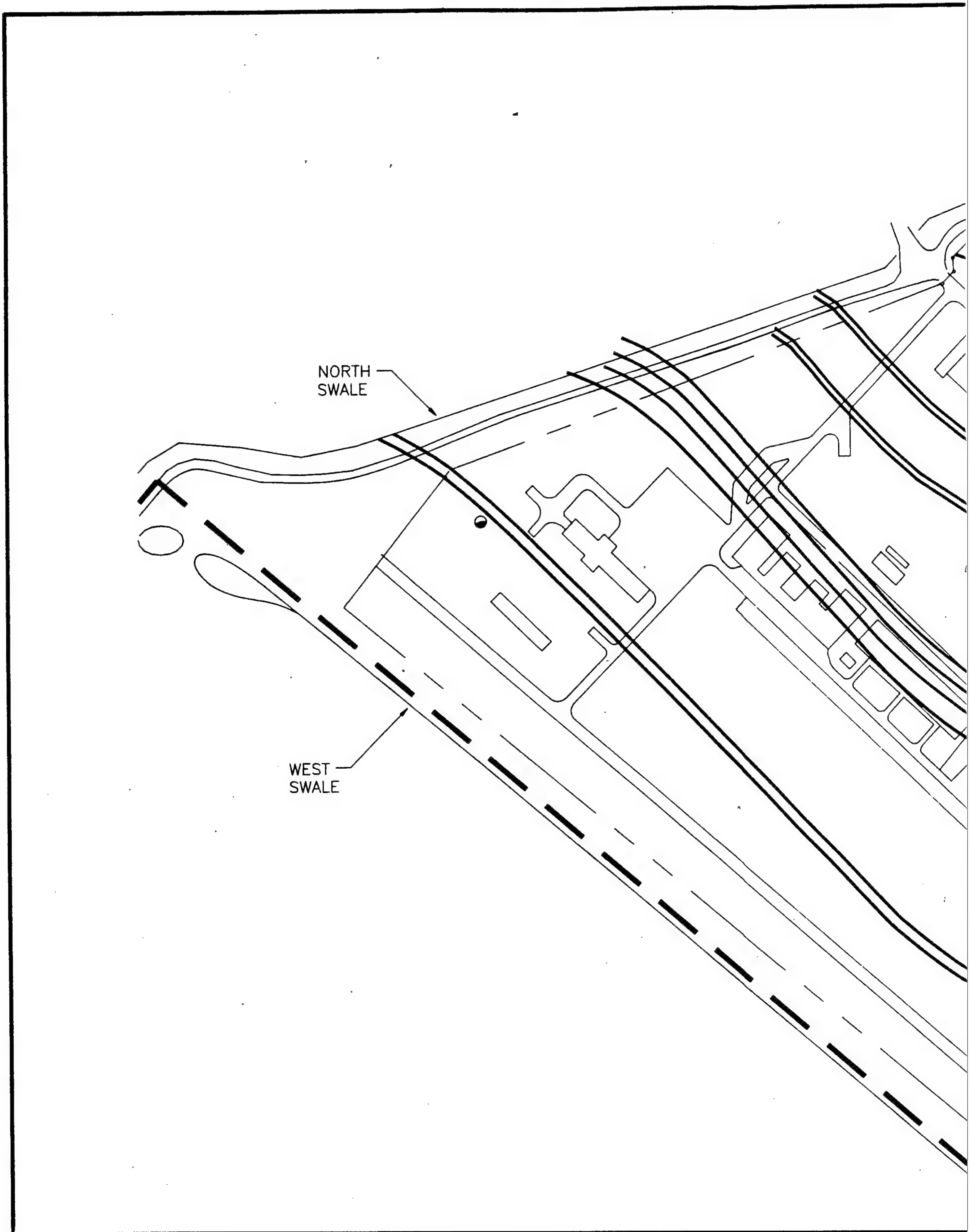
Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

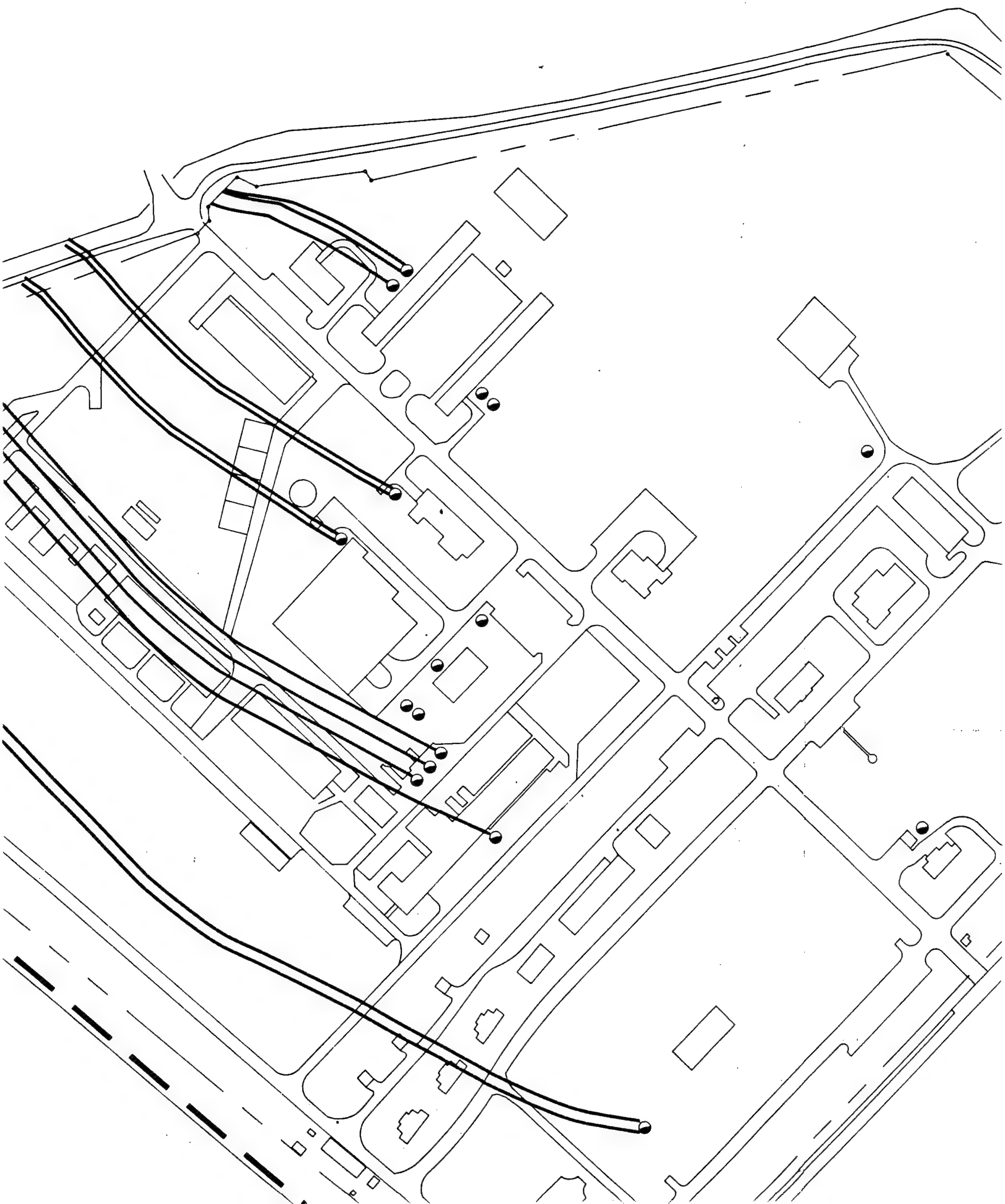
FIGURE 5.1
GROUNDWATER VELOCITIES AT PSF
JUNE 1993, LOW TIDE

PROJECT NO. 2060.000 SCALE NOTED

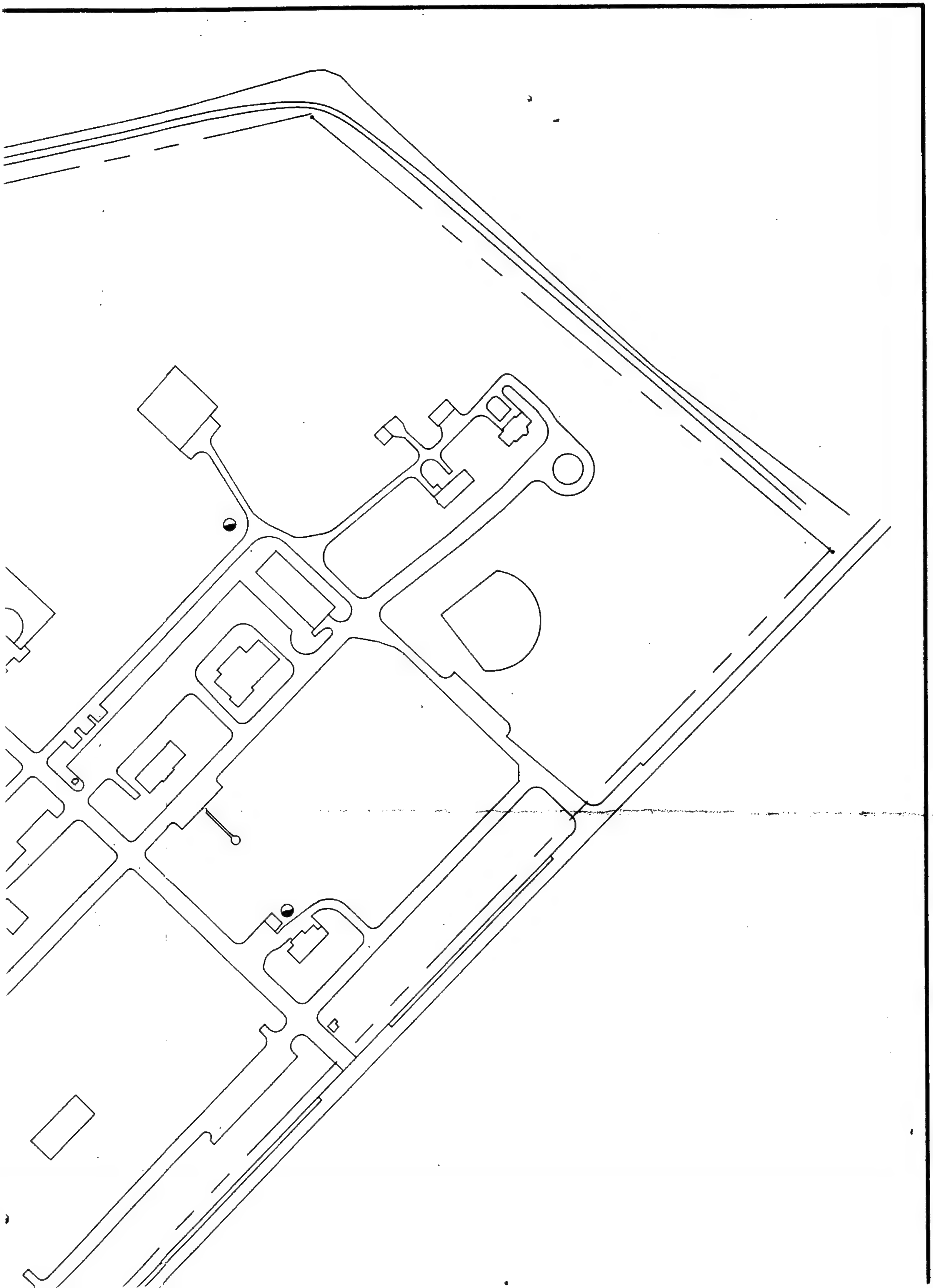
6

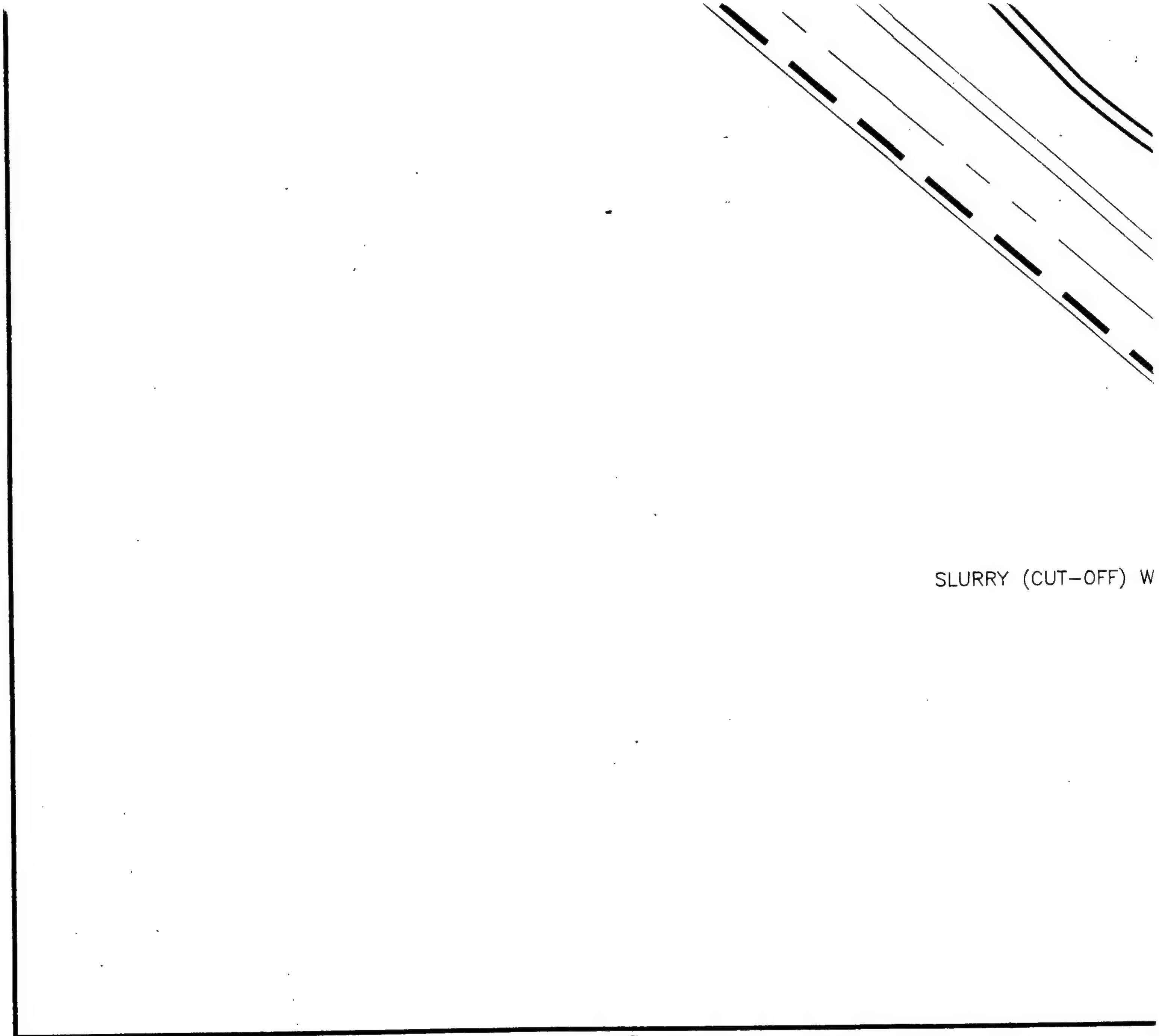
①

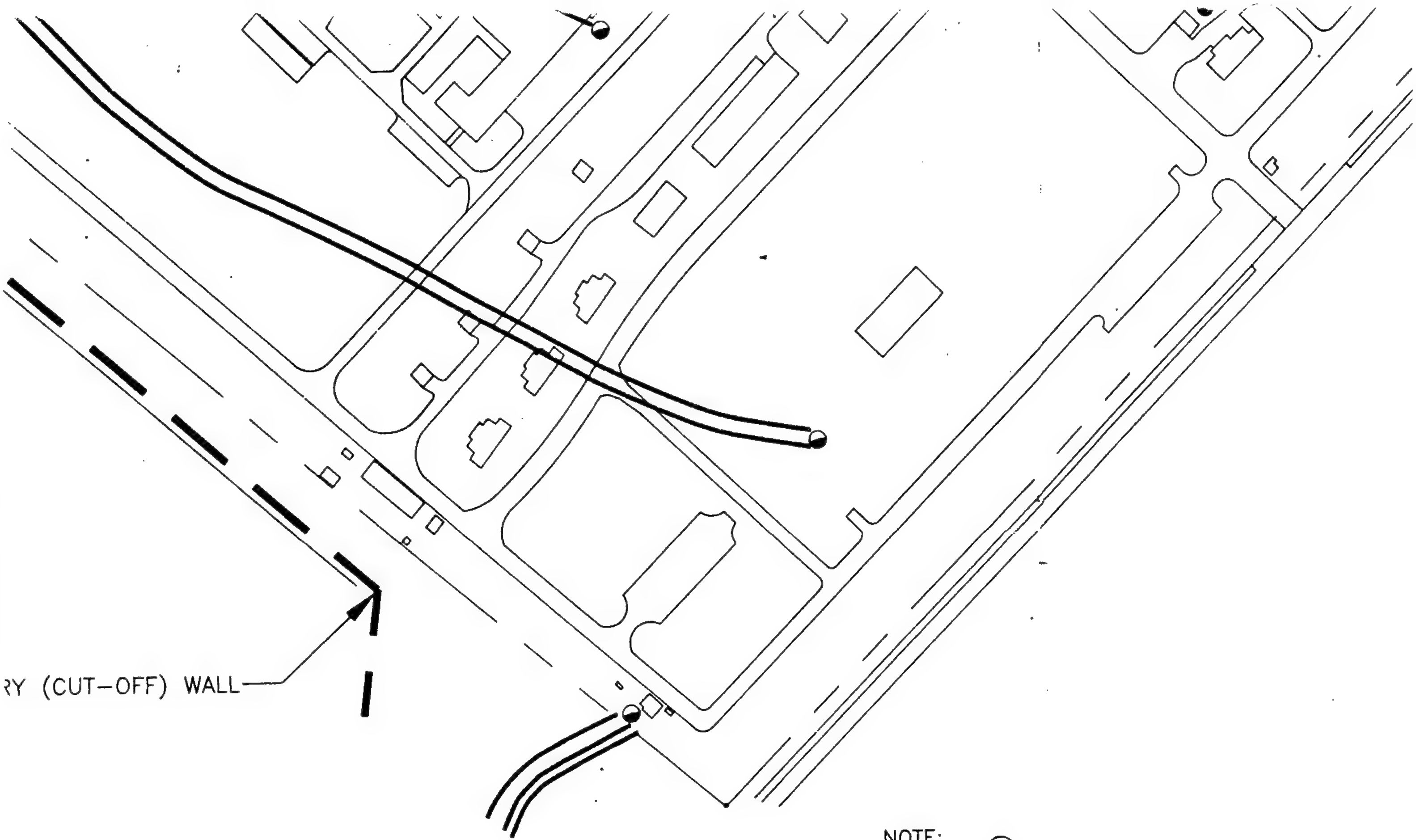




3

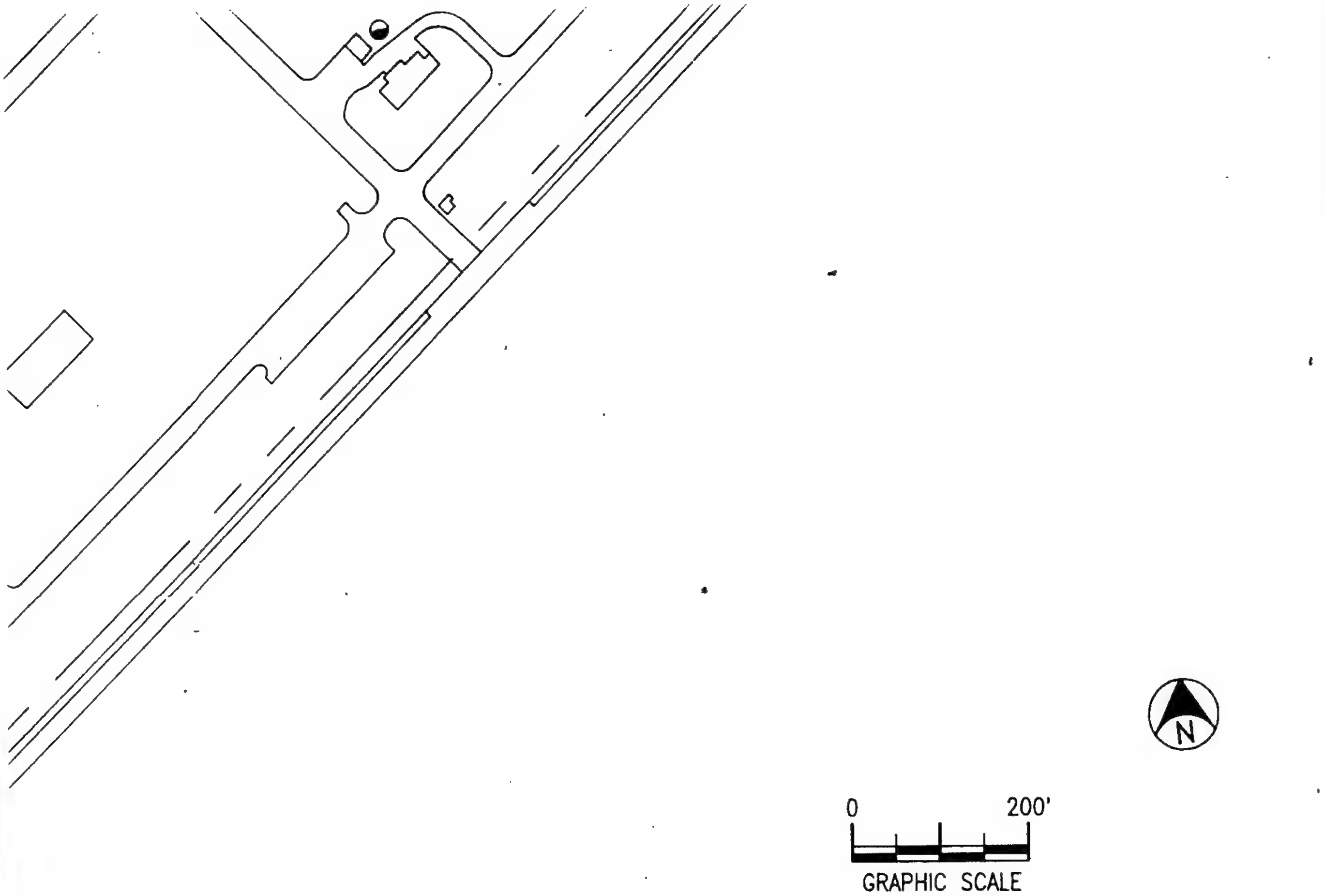



SLURRY (CUT-OFF) W




NOTE:

FLOWPATH ® DERIVED STEADY-STATE PARTICLE TRAJECTORIES (PATHLINES) ON MAP REPRESENT PROBABLE CONTAMINANT TRANSPORT PATHWAYS WHICH WOULD OCCUR FOLLOWING ANY SIGNIFICANT RELEASE TO THE AQUIFER AT THE LOCATIONS SHOWN.




NOTE:

FLOWPATH® DERIVED STEADY-STATE PARTICLE TRAJECTORIES (PATHLINES) ON MAP REPRESENT PROBABLE CONTAMINANT TRANSPORT PATHWAYS WHICH WOULD OCCUR FOLLOWING ANY SIGNIFICANT RELEASE TO THE AQUIFER AT THE LOCATIONS SHOWN.

| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | E. ASHTON | DATE 09/14/93 |
| DRAWN | J. KEMLER | 09/23/93 |
| CHECKED | D. MORGANELLI | 09/24/93 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

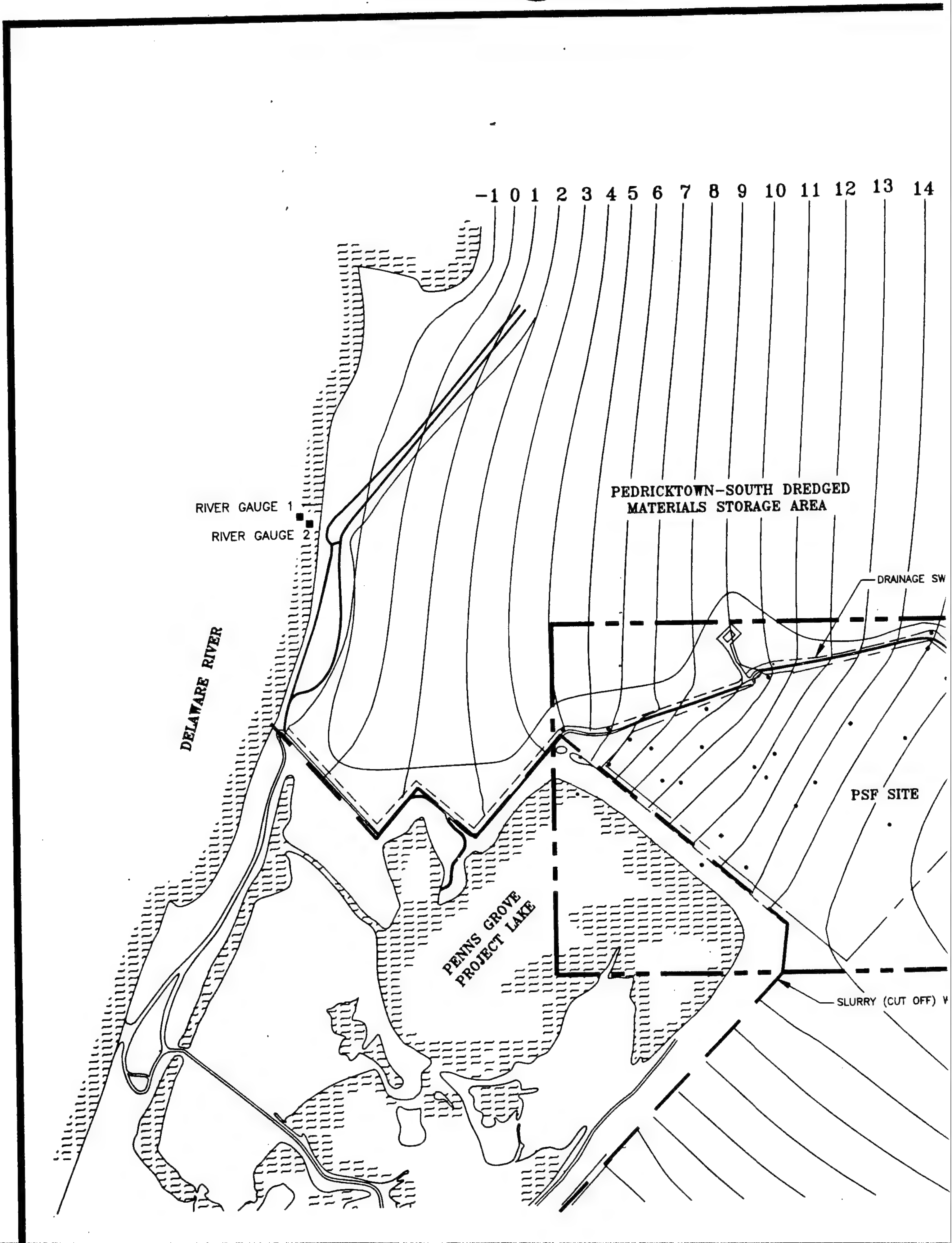
FIGURE 5.2

FLOWPATH PATHLINE MAP

(ILLUSTRATING ACTUAL PARTICLE TRACKING FROM POTENTIAL UST RELEASES)

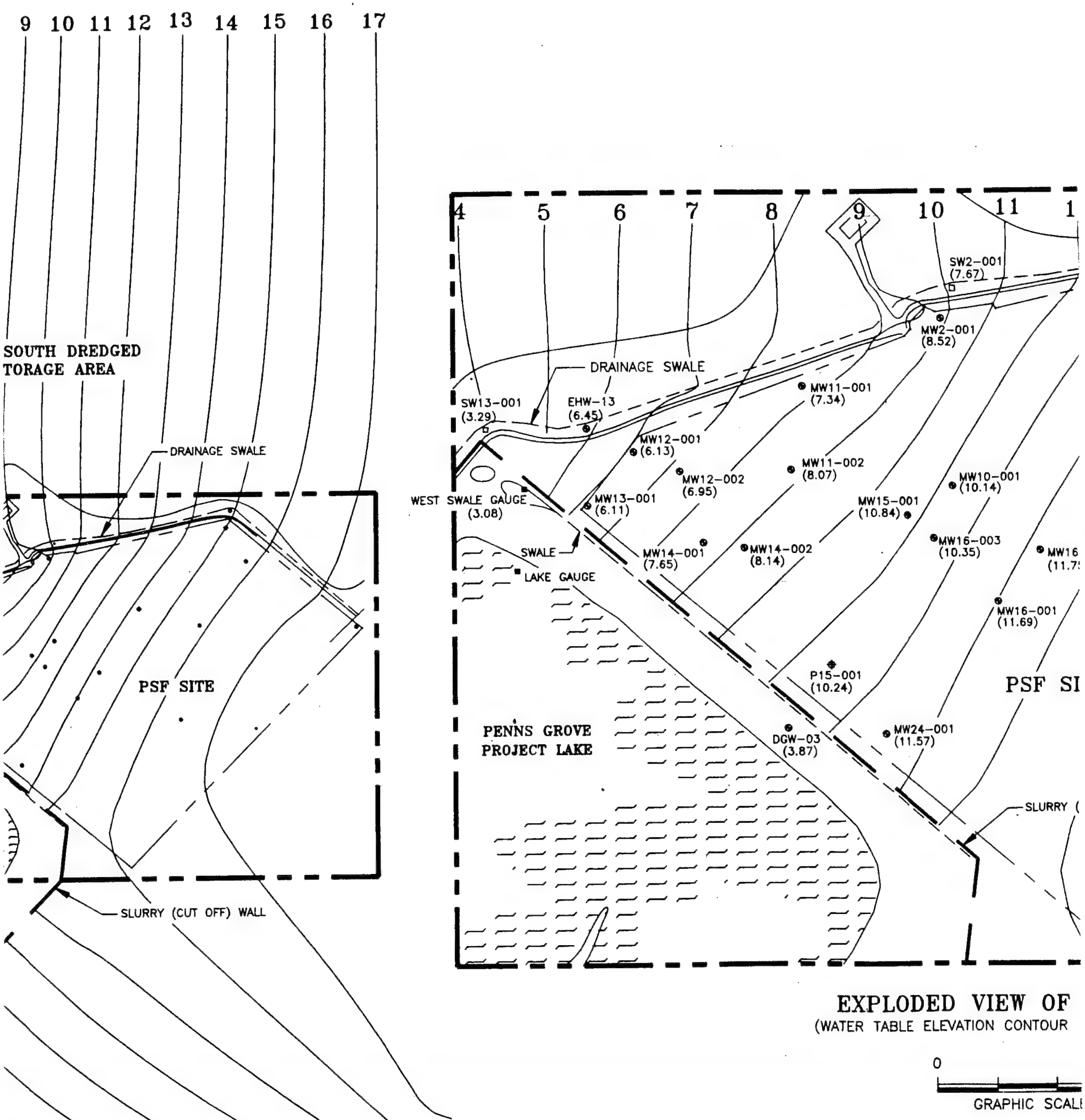
PROJECT NO. 2060.000 | SCALE NOTED

(1)



-1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
PEDRICKTOWN-SOUTH DREDGED MATERIALS STORAGE AREA
RIVER GAUGE 1
RIVER GAUGE 2
DELAWARE RIVER
DRAINAGE SW
PSF SITE
PENNS GROVE PROJECT LAKE
SLURRY (CUT OFF) W

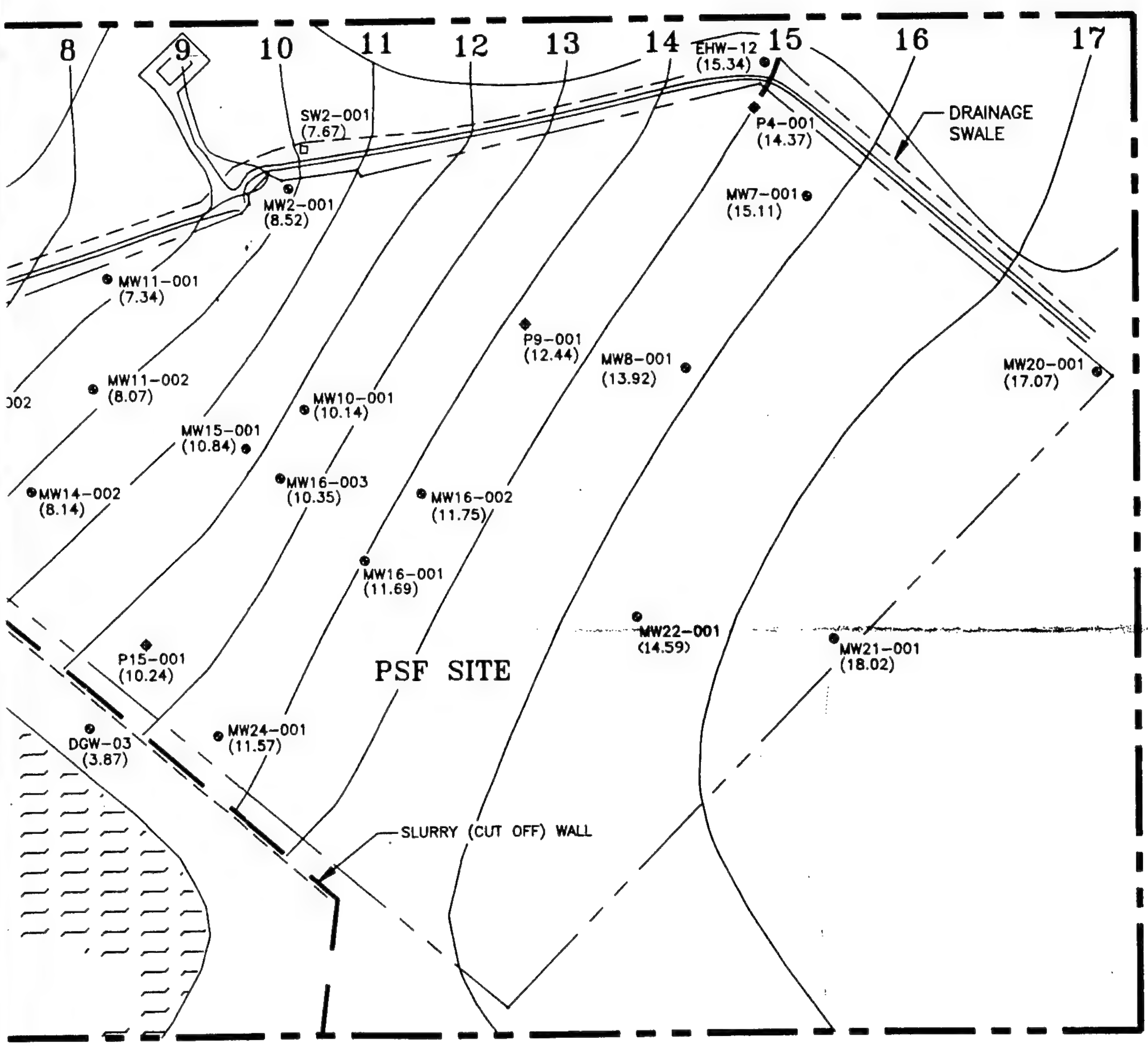
(2)




EXPLODED VIEW OF

(WATER TABLE ELEVATION CONTOUR

③

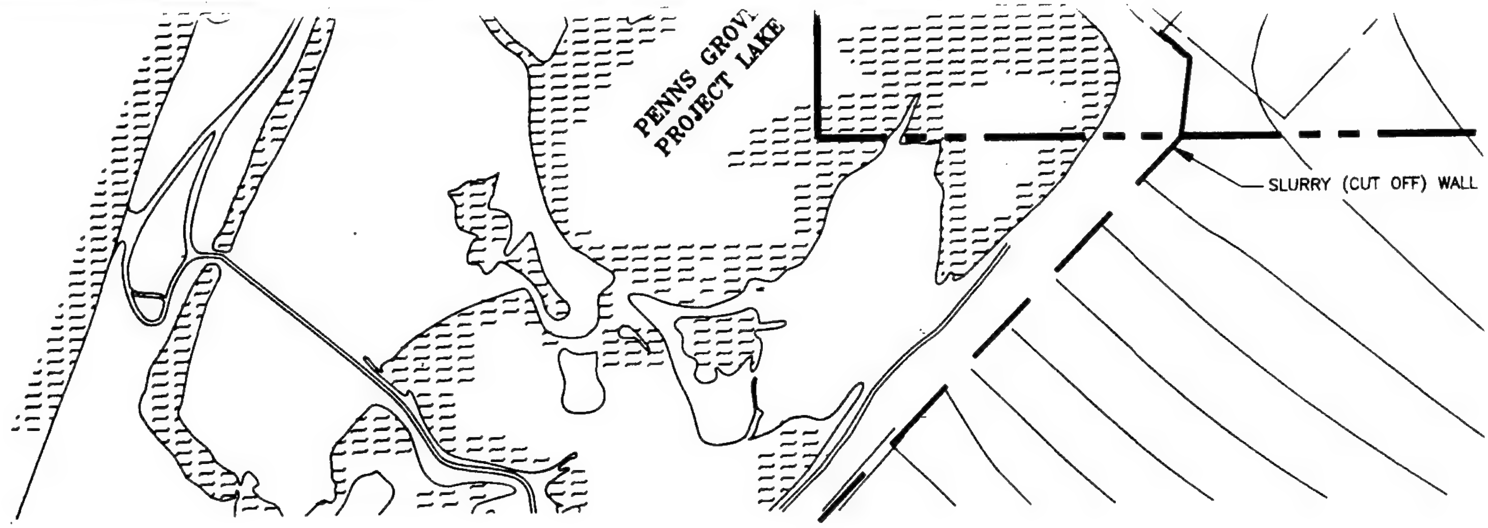



## EXPLODED VIEW OF PSF SITE

(WATER TABLE ELEVATION CONTOUR INTERVAL = 1 FOOT)

0 600'

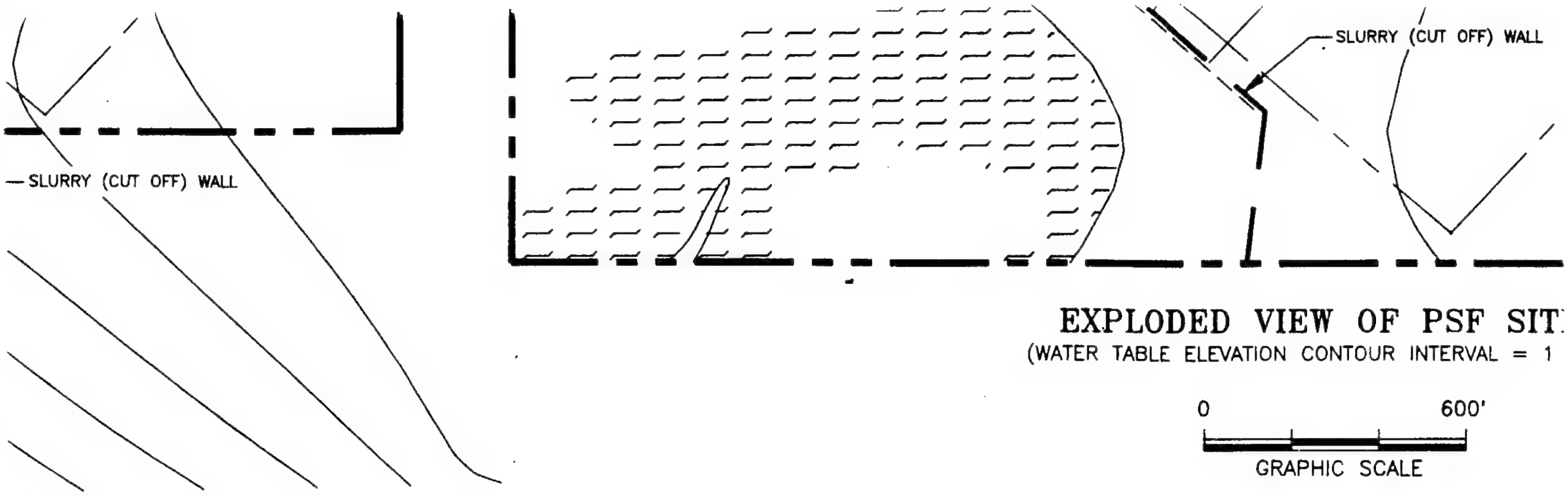
GRAPHIC SCALE




FLOWPATH® GENERATED HYDRAULIC HEAD
DISTRIBUTION FOR PSF AND CONTIGUOUS AREAS
(PSFMOD1L)

0 600'

GRAPHIC SCALE




EXPLODED VIEW OF PSF SIT

(WATER TABLE ELEVATION CONTOUR INTERVAL = 1

| | |
|---|---|
| | |
| | |
| NO. | |

PEDRICK

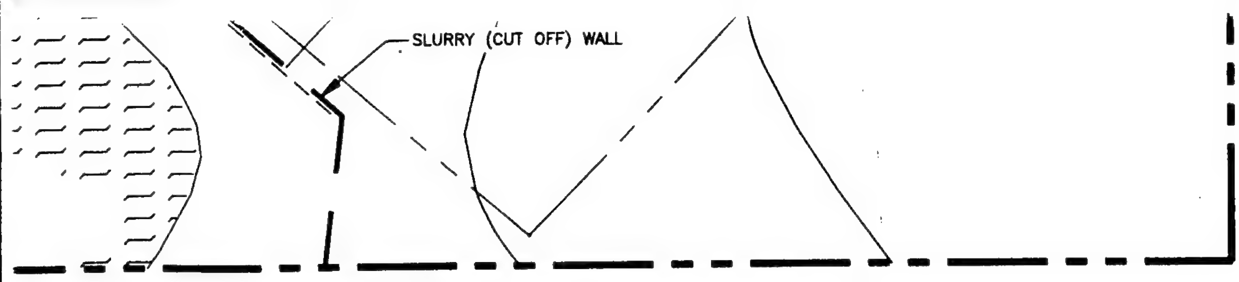
DESIGNED MORC

DRAWN KEML

CHECKED MORG

2
LAN

5




## EXPLODED VIEW OF PSF SITE

(WATER TABLE ELEVATION CONTOUR INTERVAL = 1 FOOT)

0 600'

GRAPHIC SCALE

N

| NO. | REVISIONS | BY | CHK | APP | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | |
|---|---|---|
| DESIGNED | MORGANELLI | DATE |
| DRAWN | KEMLER | 09/28/93 |
| CHECKED | MORGANELLI | 09/28/93 |

Versar INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

**FIGURE 5.3**

GROUNDWATER MODEL CALIBRATION MAP

COMPARISON OF FLOWPATH® HYDRAULIC HEAD DISTRIBUTION IN PSFMOD1L TO RECORDED PSF WATER TABLE ELEVATION AT LOW TIDE ON 06/28/93

PROJECT NO. 2060.000 SCALE NOTED

## 6.0 HAZARDOUS SUBSTANCES

A limited amount of information was available concerning the precise types and volumes of waste handled at the PSF site during its 75-year history.

### 6.1 Types of Wastes Generated

The Motor Pool area (Buildings 404 and 413) once housed various types of containers and palleted drums, including such products as hydraulic fluid, spent solvents, and waste oils. Now the area is used mainly to repair vehicles and heavy equipment, as well as for routine maintenance operations. Approximately 13 mechanical bays are housed in Building 404. Processes that may spill, or may have spilled or generated, hazardous wastes include: dispensing fuel from both the active and now inactive pump islands; refueling USTs; and containerizing waste oil and other vehicle fluids. In addition, any improper tank abandonment may lead to releases of fuel oil; reportedly, the vehicle wash rack south of Building 404 sometimes overflows its contents into the storm sewer system. The PA Report stated that according to facility personnel and U.S. Army records, the 78th Division Motor Pool generates the following wastes: waste oil, battery acid, solvents, brake fluid, anti-freeze, mineral spirits, dye (gasoline additive), and anti-static agents. Most of these wastes are collected and disposed of by Safety-Kleen, Inc. of Elgin, Illinois.

The facility's Paint Shop, located in Building 184, formerly generated various paint thinners and solvents during its operation, mainly utilized in paint stripping procedures.

The Sewage Treatment Plant, located in Building 530, treats the raw sewage utilizing powdered carbon filtration. The plant reportedly produces very little sludge. However, chemical analysis of sludge generated in 1987 revealed detectable concentrations of heavy metals and other selected chemical parameters, according to the PA Report. According to Corps documentation, no sludge was generated in 1990 or 1991.

There have been approximately 53 underground storage tanks (USTs) at the site containing a wide spectrum of products ranging from heavy-grade fuel oils to gasoline. Of the USTs on-site, three contain or have contained waste oil generated from on-site activities. If previous spillage has occurred, impact to the native environment could be considered hazardous waste.

From 1918 to 1958, Buildings 495, 494, 485, 474, 464, 434 and the adjacent grounds were engaged in ordnance disassembly and/or renovation activities and served

an unclear role in ordnance processing. Building 495 still contains the remnants of an old railroad track embedded in the concrete floor. The PA Report listed possible waste streams produced during ordnance processing operations, including, but not limited to, explosive compounds, oil and grease, hydraulic fluid, solvents, and heavy metals.

The former Nike Missile Command Center (inactive since 1965) involved Buildings 422, 432, 452, 461 and the surrounding grounds. Detailed operations of the command center are not available, due to the sensitive nature of the military defense industry. Therefore, detailed waste stream analysis cannot be determined. However, previous soil gas survey data indicated contaminants in the area, possibly associated with releases from several abandoned fuel oil tanks near Buildings 432 and 422. Contaminants identified in this area by the PA Petrex™ soil gas survey included: PCE, DCE, TCE, Freon 11, tetrachloroethane (TCA), dichlorobenzene and trichlorobenzene.

Reportedly, the former scrap metal storage area in the north-central portion of PSF, north of Building 590, once consisted of a staging area for spent artillery shell casings. Explosives and/or heavy metals might be associated with these wastes.

Former coal bins, numbered as structure 471 on the site figures, are currently used to store miscellaneous scrap lumber, furniture, and metal. Historical photographs indicate that the contents of these bins sometimes exceeded their capacities. Previous storage of coal and other materials may have produced hydrocarbon and/or heavy metal wastes in this area.

An abandoned swimming pool, numbered as structure 289 on the site maps, is located in the southern corner of PSF. The PA listed the area as containing abandoned chlorine gas tanks. Versar personnel did not note the presence of chlorine tanks in the area during their September 1993 inspection.

From the previous operational and historical information, a list of suspected contaminants of concern at the site was compiled, including: petroleum hydrocarbons, volatile organic compounds (including BETX and chlorinated solvents), semivolatile compounds (including PAHs), explosive parameters (including picric acid, nitrocellulose/nitroglycerin, 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, tetryl, HMX, and RDX), and heavy metals (including lead, cadmium, and chromium).

## 7.0 INVESTIGATION OF POSSIBLE CONTAMINANT SOURCES

### 7.1 Areas of Concern

Although individual AOCs were outlined in detail in the PSF ESI Project Plan, the occurrence of identified water and soil contaminants at the site was sporadic and did not correlate with any of the predicted AOCs. Because the analytical results from this ESI did not warrant discussing each AOC on an individual basis, the contaminants found on-site were discussed previously, on a sample media basis (Sections 3.0, 4.0 and 5.0). A summary of the most significant contamination found at PSF is discussed in Section 10.0 of this report.

### 7.2 Tank Confirmation Surveys

Versar reviewed the available data regarding all the tanks located at PSF. Initially, Versar was provided with UST and AST information within the RMC PA Report, previous UST registration data, a U.S. Army Reserve Center (USARC) UST inventory/test data listing, and a site blueprint locating active, inactive, possible (unconfirmed), and abandoned locations of the tanks at PSF, as well as former building locations.

In April 1991, RMC listed 22 active USTs on-site, 23 abandoned USTs, 2 former AST locations, and 4 possible USTs about which there was no available information. The USARC listed 13 steel USTs at the PSF site; they had been installed between 1931 and 1964 and were all precision tested in 1991. From the state registration data provided, it appears that some of these USTs had been registered at one time.

Issues related to the compliance with federal and state UST regulations were not included in the scope-of-work for PSF at this time. The current regulatory status of the tanks at PSF was therefore not fully investigated; however, it appears that the USTs on-site are not currently registered and do not comply with regulatory requirements. The NJDEPE requires annual registration for all active tanks, as well as proper tank closure procedures for inactive or abandoned tanks. Recommendations concerning UST upgrading and/or closure activities are provided in Section 11.0 of this report.

From the data provided, Versar completed a tank confirmation survey on-site that included: an on-site, personal interview with the Facility Engineer, Stan Heinert; a building-to-building inspection to identify interior and exterior UST locations, fill pipes, vents pipes, associated manways, and unexplained pavement patching; a magnetometer survey; and a ground-penetrating radar (GPR) survey.

Versar confirmed the locations of 2 active ASTs, 2 inactive ASTs, 21 active USTs, 26 abandoned USTs, and 6 GPR-confirmed tank anomalies on-site, for a total of 57 tanks. Tank locations were identified by visual inspection, site maps, and previous investigations, as well as by magnetometer and GPR surveys, and were documented in field logbooks and in photographs (Appendix A). Actual locations of the identified ASTs and USTs are summarized in Table 7.1 and are depicted on Figure 7.1.

The magnetometer survey included an investigation at each former building location suspected to have had an associated UST. Versar utilized a hand-held, Gisco Model 480, pipe and cable locator in the induction mode to conduct the survey. The magnetometer was calibrated in a metal-free area and then taken into the search area. The instrument was held at arm's length with the handle parallel to the ground. The suspected area was searched systematically in a 4-foot grid pattern. As a buried conductor was crossed, the instrument emitted a full audio signal. A mark on the ground was made at this point and the search was continued in the same direction until no signal was emitted. The instrument was then turned 180° and walked back over the same path until a positive signal was again encountered. A second mark was made at this point and the buried conductor was assumed to be located between the two marks. Once a buried conductor was located, the search was confined to that area until the outline of the object was established. Because the magnetometer detects only buried metal objects and cannot distinguish between them, it was not possible to confirm that the conductors detected within the search areas were USTs.

Versar began the magnetometer survey on April 20 and 21, 1993, and completed it on May 10 and 11, 1993. Of the 26 search areas investigated, 11 of them exhibited positive readings, indicating a conductor below the ground surface. These 11 areas were then subjected to GPR in order to further establish whether any of the areas contained unknown USTs.

The GPR survey was conducted on-site by International Exploration (Intex) of Doylestown, Pennsylvania. GPR uses high frequency radio waves to acquire subsurface information. From a small antenna which is moved slowly across the surface of the ground, energy is radiated downward into the subsurface, then reflected back to the receiving antenna, where variations in the return signal are continuously recorded; this produces a continuous cross-sectional "picture" or profile of shallow subsurface conditions. These responses are caused by radar wave reflections from interfaces of materials having different electrical properties. These reflections can depict

natural geohydrologic conditions such as bedding, cementation, clay content, moisture, voids, fractures, and intrusions, as well as man-made objects, such as buried USTs. The depth of radar penetration is highly site-specific, dependent upon the properties of the site soil and bedrock. In general, better overall penetration is achieved in dry, sandy or rocky areas, and poorer results are obtained in moist, clayey or conductive soils.

Intex completed the on-site GPR survey July 20 and 21, 1993, using a GSSI SIR-3 GPR unit with a 500 mhz antenna. Lines were completed in two directions at each survey location, at 90 degree orientations. Typically, lines were separated by 10 feet on the ground surface. The areas determined for the GPR survey were numbered 1 through 11. Figure 7.2 shows the 11 areas investigated with the suspected/discovered UST locations reported by Intex. The GPR survey recognized anomalies including objects which resembled tanks or similarly-shaped objects, smaller point targets such as underground lines or discrete objects, reflecting surfaces (i.e., a buried concrete pad), and areas of disturbed strata.

GPR revealed/confirmed 9 USTs in Areas 2, 4, 6, 8, 9, and 10, and buried piping in Areas 1, 3, 5, 7, 8, and 10. Of these 9 USTs located by Intex, only 3 were previously known (those found in Area 4). The remaining 6 USTs are listed in Table 7.1 as "suspected" tanks. GPR in Area 4 confirmed the axes of the 3 active USTs near the motor pool but did not locate the suspected abandoned USTs reported to lie southeast of Building 413 (labeled AA, BB, and CC on Figure 7.1). Therefore, these reported abandoned USTs may have already been removed or perhaps lie further south under Delaware Road, closer to Building 404. The remaining five GPR Survey Areas were each reported by Intex to contain one UST, except for the two USTs reported to lie in Area 10. Intex's report, with area-specific maps, is included in Appendix I.

In reference to the hydrogeologic investigation at the PSF site, it must be noted that all USTs are currently either partially or wholly submerged beneath the water table. This submersion has occurred since the 1958-59 geotechnical borings were drilled because of the construction of the bentonite slurry wall surrounding the Penns Grove Project site. This fact has obvious implications relative to any future tank closure activities.

### 7.3 Electrical Transformer Inventory

Versar inspected the site for electrical transformer locations on April 21, 1993. An initial list was provided in RMC's PA Report, and Versar visually confirmed

each location and inspected each transformer location for leakage, associated soil staining and for any evidence of stressed vegetation. RMC previously inspected the on-site transformers in 1991 and found none to be leaking. RMC also reported that all the transformers on-site are owned by the Army, and that they are all suspected to be PCB-containing. This information was verified by Versar.

Forty-one pole-mounted or modified pole-mounted transformers were located on-site, as well as 3 ground-mounted transformers. Six of the pole-mounted transformers were noted to be inactive at this time. All the others remain active. Each transformer was noted to be in fair to good physical condition.

No soil staining was noted near any of the transformers in the recent inspection. RMC also reported in 1991 that there was no mention of leaks in any of the Army records. At 3 locations, adjacent to Route 130, east of Building 322, and northwest of Building 371, suspected stressed vegetation was observed directly underneath the transformers (Appendix A, Photographs 25-27). The transformers located northwest of Building 371, however, are reported to be inactive. A summary of the transformer locations is provided as Table 7.2 and each location is depicted on Figure 7.1. Photographs 25-46 (Appendix A) show the various transformer locations and mountings.

## 7.4 Unexploded Ordnance Survey

From 1918 to 1958, an Ordnance Disassembly/Chemical Plant was in operation at the site. Buildings 495, 494, 474, 464, 434, and adjacent grounds to the north were part of the Delaware Ordnance Depot, which was responsible for assembling artillery shells. Some of the buildings were used to renovate or disassemble ordnance and reclaim brass shell casings. Aerial photographs taken in 1940 indicate a large pile of dark granular material stockpiled near Building 495. It is not known whether these stockpiled materials were associated with ordnance disassembly activities. Additionally, shell casings were evident at PSF in the metal scrap storage area northeast of the wash-rack structure (Building 590).

Unexploded ordnance (UXO) clearance operations were completed by USAEC-approved, qualified personnel before drilling activities commenced on-site. Remote sensing techniques were used to detect subsurface ordnance items at each drilling location required in the previous ordnance disassembly area. These techniques typically include some or all of the following: metal detection, magnetometry, ground penetrating radar, resistivity, geophysical diffraction tomography, electromagnetic

induction, and seismic methods. UXO personnel were required to meet the Department of the Army, USAEC (DAAA15-90-R-0129), Section C.3.1.2.4, Unexploded Ordnance Support specifications.

UXB International, Inc., (UXB) of Chantilly, Virginia, performed the UXO survey at PSF on June 1 and 7, 1993. UXB was prepared to locate, identify, recover, remove, and consolidate all ordnance and stage these items away from the work area in a safe and environmentally-acceptable manner. UXB personnel used only metal detection, magnetometry, and ground-penetrating radar to complete the survey. UXB cleared each drilling location to a depth of 10 feet, approximately 7 feet below the water table. Monitoring well MW13-001 and a 15-foot radius around it was cleared at its original staked location, along with a 50-foot wide, 200-foot long access route for the drill rig. Soil borings SB10-001, SB11-001, SB11-002, and SB11-003 were each moved before clearance could be given. Non-clearance was generally due to surficial cobbles and not necessarily detection of possible unexploded ordnance items. SB10-001 was moved 1-1/2 feet southeast of its original staked location; SB11-001 was relocated 1-1/2 feet east; SB11-002 was relocated 1-1/2 feet north; and SB11-003 was moved 2 feet east of its original location.

Table 7.1
INVENTORY OF UNDERGROUND AND ABOVEGROUND STORAGE TANKS
Pedricktown Support Facility
Salem County, New Jersey

| Location | Letter Keyed to Location Map (Figure 7.1) | No. of Tanks | Type | Status | Capacity | Contents |
|---|---|---|---|---|---|---|
| Bldg. 130 | A | 1 | UST | Abandoned | 550 Gal.? | Fuel Oil |
| Bldg. 171 | B | 1 | UST | Active | 1,500 Gal. | Fuel Oil |
| Bldg. 173 | C | 1 | UST | Active | 1,000 Gal. | Fuel Oil |
| Bldg. 173 | D | 1 | UST | Active | 4,000 Gal. | Fuel Oil |
| Bldg. 184 | E | 1 | AST | Active | 550 Gal. | Fuel Oil |
| Bldg. 177 South | F | 1 | UST | Active | 1,000 Gal. | Fuel Oil |
| Bldg. 179 | G | 1 | UST | Active | 1,000 Gal | Fuel Oil |
| Bldg. 229 | H | 1 | UST | Abandoned | Unknown | Gasoline |
| Former Bldg 233 | I | 1 | UST | Abandoned | Unknown | Unknown |
| Bldg. 278 | J | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 278 | K | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 277 | L | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 277 | M | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 276 | N | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 276 | O | 1 | UST | Active | 550 Gal. | Fuel Oil |
| Bldg. 274 | P | 1 | UST | Active | 1,000 Gal | Fuel Oil |
| Bldg. 273 | Q | 1 | UST | Active | 1,500 Gal | Fuel Oil |
| South, Helipad (315) | R | 1 | UST | Abandoned | Unknown | Unknown |
| Bldg. 322 | S | 1 | UST | Active | 5,000 Gal. | Fuel Oil |
| East, Bldg. 351 | T | 1 | UST | Abandoned | Unknown | Fuel Oil? |
| East, Bldg. 351 | U | 1 | UST | Abandoned | Unknown | Fuel Oil? |
| West Bldg. 371 | V | 1 | UST | Abandoned | Unknown | Fuel Oil? |
| West, Bldg. 371 | W | 1 | UST | Abandoned | Unknown | Fuel Oil? |
| Bldg. 380 | X | 1 | UST | Active | 5,000 Gal. | Fuel Oil |
| Bldg. 404 East | Y | 1 | UST | Abandoned | Unknown | Waste Oil |
| Bldg. 404 West | Z | 1 | UST | Active | 6,000 Gal. | Fuel Oil |
| East, Bldg. 413 | AA | 1 | UST | Abandoned | Unknown | Gasoline/Diesel? |
| East, Bldg. 413 | BB | 1 | UST | Abandoned | Unknown | Gasoline/Diesel? |
| East, Bldg. 413 | CC | 1 | UST | Abandoned | Unknown | Gasoline/Diesel? |

Table 7.1 (continued)
INVENTORY OF UNDERGROUND AND ABOVEGROUND STORAGE TANKS
Pedricktown Support Facility
Salem County, New Jersey

| Location | Letter Keyed to Location Map (Figure 7.1) | No. of Tanks | Type | Status | Capacity | Contents |
|---|---|---|---|---|---|---|
| South, Bldg 413 | DD | 1 | UST | Active | 10,000 Gal. | Diesel |
| West. Bldg. 413 | EE | 1 | UST | Active | 1,000 Gal.? | Waste Oil |
| North, Bldg. 413 | FF | 1 | UST | Active | 10,000 Gal.? | Gasoline |
| Southwest, Bldg. 422 | GG | 1 | UST | Abandoned | 12,000 Gal. | Diesel |
| Southwest, Bldg. 422 | HH | 1 | UST | Abandoned | 12,000 Gal. | Diesel |
| West, Bldg. 422 | II | 1 | UST | Abandoned | 275 Gal. | Waste Oil |
| North, Bldg. 422 | JJ | 1 | UST | Abandoned | 2,000 Gal. | Fuel Oil |
| Northwest, Bldg. 432 | KK | 1 | UST | Abandoned | 8,000 Gal. | Fuel Oil |
| Northwest, Bldg. 432 | LL | 1 | UST | Abandoned | 7,000 Gal. | Pneumatic Fluids |
| Northwest, Bldg. 432 | MM | 1 | UST | Abandoned | 12,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | NN | 1 | UST | Abandoned | 12,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | OO | 1 | UST | Abandoned | 19,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | PP | 1 | UST | Abandoned | 19,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | QQ | 1 | UST | Abandoned | 19,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | RR | 1 | UST | Abandoned | 19,000 Gal. | Potable Water |
| Northwest, Bldg. 432 | SS | 1 | UST | Abandoned | 19,000 Gal. | Potable Water |
| Bldg. 485 | TT | 1 | UST | Active | 6,000 Gal. | Fuel Oil |
| West, Bldg. 506 | UU | 1 | AST | Active | Unknown | Fuel Oil |
| Bldg. 506 | VV | 1 | UST | Active | 1,000 Gal. | Fuel Oil |
| West, Bldg. 506 | WW | 1 | UST | Abandoned | Unknown | Unknown |
| Northeast, Bldg. 495 | GPR Area 2 | 1 | UST | Abandoned | Suspected - located by GPR | |
| North, Bldg. 239 | GPR Area 6 | 1 | UST | Abandoned | Suspected - located by GPR | |
| Northeast, Bldg. 273 | GPR Area 8 | 1 | UST | Abandoned | Suspected - located by GPR | |

Table 7.1 (continued)
INVENTORY OF UNDERGROUND AND ABOVEGROUND STORAGE TANKS
Pedricktown Support Facility
Salem County, New Jersey

| Location | Letter Keyed to Location Map (Figure 7.1) | No. of Tanks | Type | Status | Capacity | Contents |
|---|---|---|---|---|---|---|
| South, Bldg. 190 | GPR Area 9 | 1 | UST | Abandoned | Suspected - located by GPR | |
| West, Bldg. 100 | GPR Area 10 | 1 | UST | Abandoned | Suspected - located by GPR | |
| West, Bldg. 100 | GPR Area 10 | 1 | UST | Abandoned | Suspected - located by GPR | |

UST - Underground Storage Tank
AST - Aboveground Storage Tank

NOTE: Two large abandoned ASTs were also located on-site: one is Bldg. 461 and the other is located in the southern corner of the site, north of Bldg. 239. It is believed that both of these stored potable water at one time.

This list was compiled from RMC's PA report, USARC Listings and Field Confirmation Surveys.

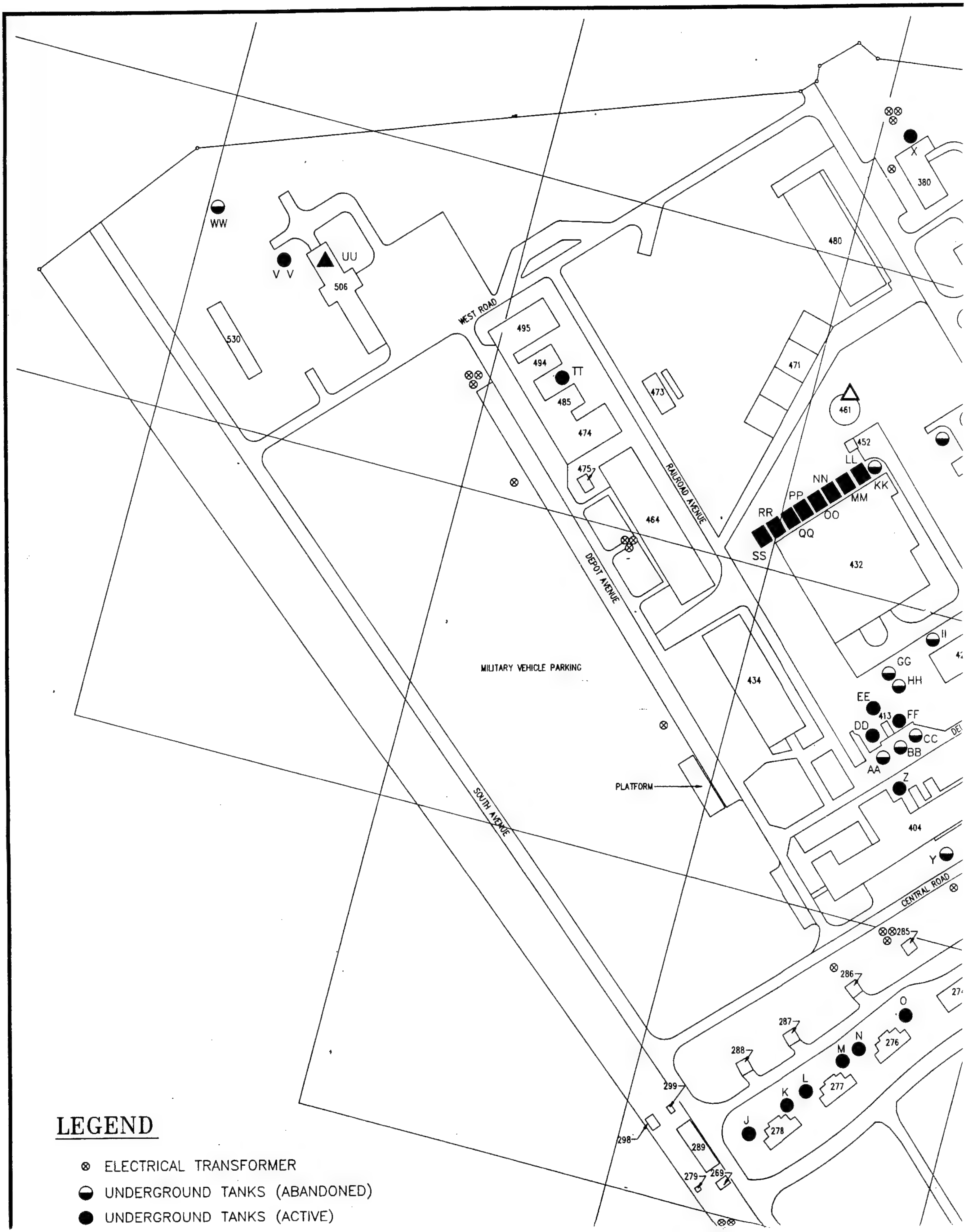
Table 7.2

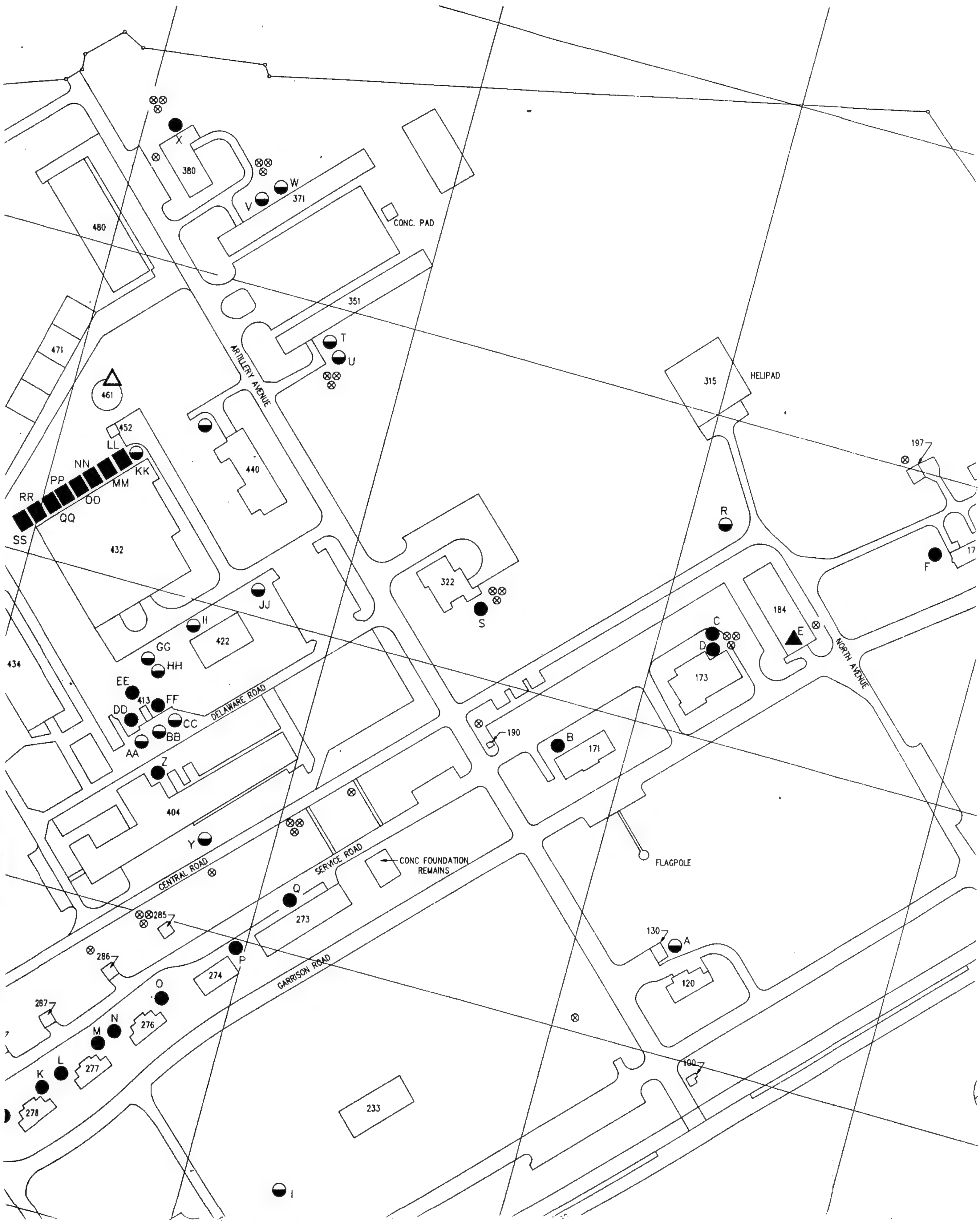
INVENTORY OF ELECTRICAL TRANSFORMERS
Pedricktown Support Facility
Salem County, New Jersey

| Location | Number of Transformers | Type of Transformer | Status |
|---|---|---|---|
| Bldg. 229, West | 1 | PM | A |
| Adjacent to U.S. Route 130 | 3 | PM | A |
| Bldg. 269, Southeast | 3 | PM | A |
| Bldg. 120, Southwest | 1 | PM | A |
| Bldg. 173, North | 3 | PM | A |
| Bldg. 184, North | 1 | PM | A |
| Bldg. 197, Northwest | 1 | PM | A |
| Bldg. 322, East | 3 | PM | A |
| Bldg. 351, South | 3 | PM | I |
| Bldg. 371, Northwest | 3 | PM | I |
| Bldg. 380, Northwest | 3 | PM | A |
| Bldg. 380, West | 1 | PM | A |
| Bldg. 434, Southwest | 1 | PM | A |
| Bldg. 464, Southwest | 3 | PM | A |
| Bldg. 474, Southwest | 1 | PM | A |
| Bldg. 495, Southwest | 3 | GM | A |
| Bldg. 190, Northwest | 1 | PM | A |
| Bldg. 285, West | 3 | PM | A |
| Bldg. 286, Northwest | 1 | PM | A |
| Bldg. 273, North | 3 | PM | A |
| Bldg. 273, North | 1 | PM | A |
| Bldg. 273, West | 1 | PM | A |

NOTES: PM = pole-mounted transformer
GM = ground-mounted transformer
A = active transformer
I = inactive transformer

1


WW
UU
V V
506
530
WEST ROAD
495
494
TT
485
474
475
464
473
471
461
480
380
X
452
LL
KK
NN
MM
PP
OO
RR
QQ
SS
432
RAILROAD AVENUE
DEPOT AVENUE
MILITARY VEHICLE PARKING
434
II
GG
HH
EE
FF
413
DD
CC
BB
AA
Z
PLATFORM
404
Y
SOUTH AVENUE
CENTRAL ROAD
285
286
287
288
O
N
M
L
K
J
276
277
278
299
298
289
279
269
LEGEND
ELECTRICAL TRANSFORMER
UNDERGROUND TANKS (ABANDONED)
UNDERGROUND TANKS (ACTIVE)


X
380
V
W
371
CONC. PAD
480
351
471
461
T
U
ARTILLERY AVENUE
315
HELIPAD
452
LL
NN
KK
PP
MM
RR
OO
QQ
SS
432
440
197
R
17
F
322
S
184
JJ
II
422
C
E
D
173
NORTH AVENUE
434
GG
HH
EE
413
FF
DD
DELAWARE ROAD
CC
BB
AA
190
B
171
Z
404
Y
CENTRAL ROAD
SERVICE ROAD
CONC FOUNDATION
REMAINS
FLAGPOLE
Q
273
285
P
130
A
286
274
GARRISON ROAD
120
O
287
N
M
276
L
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278
100
233
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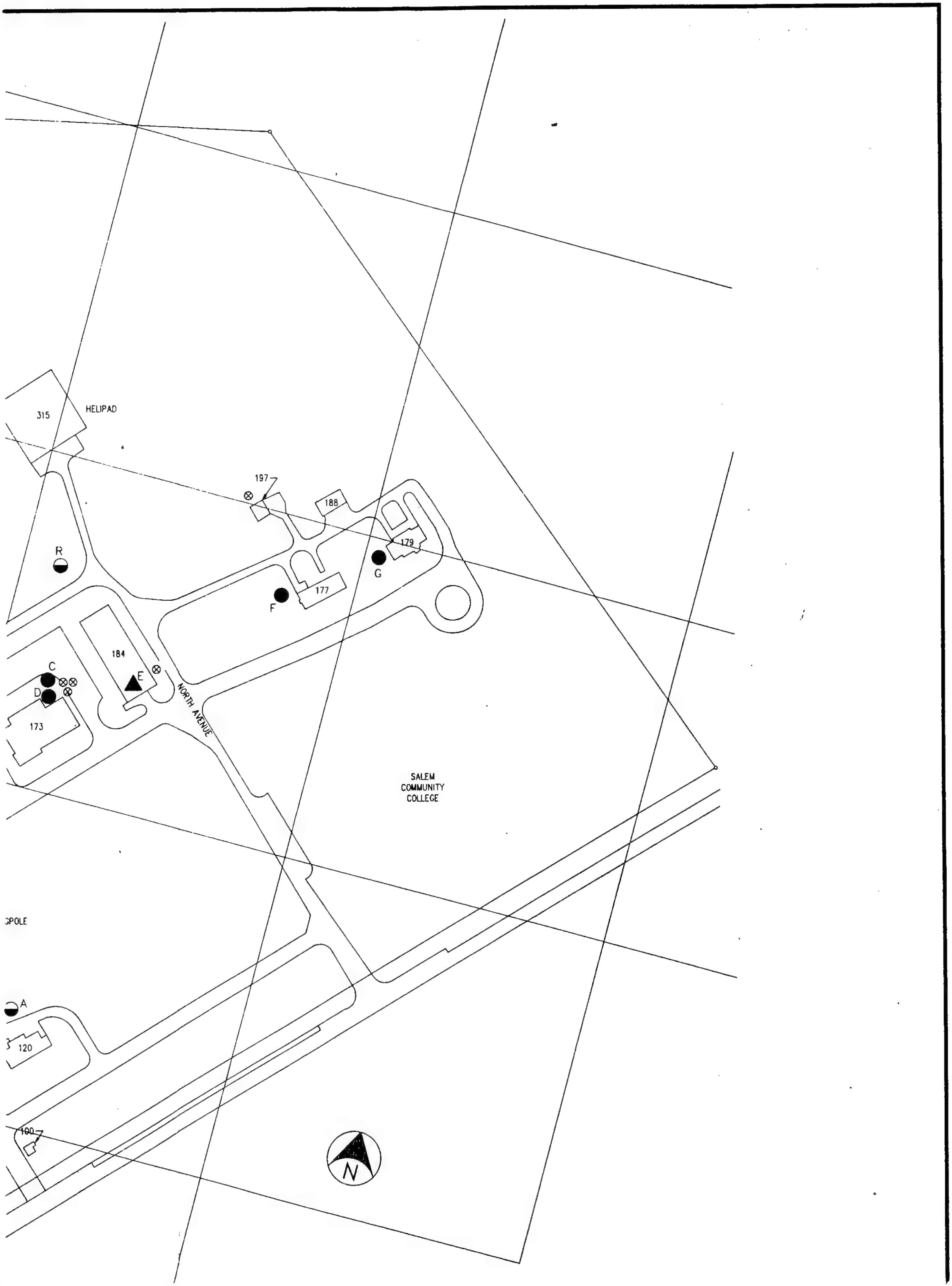
(3)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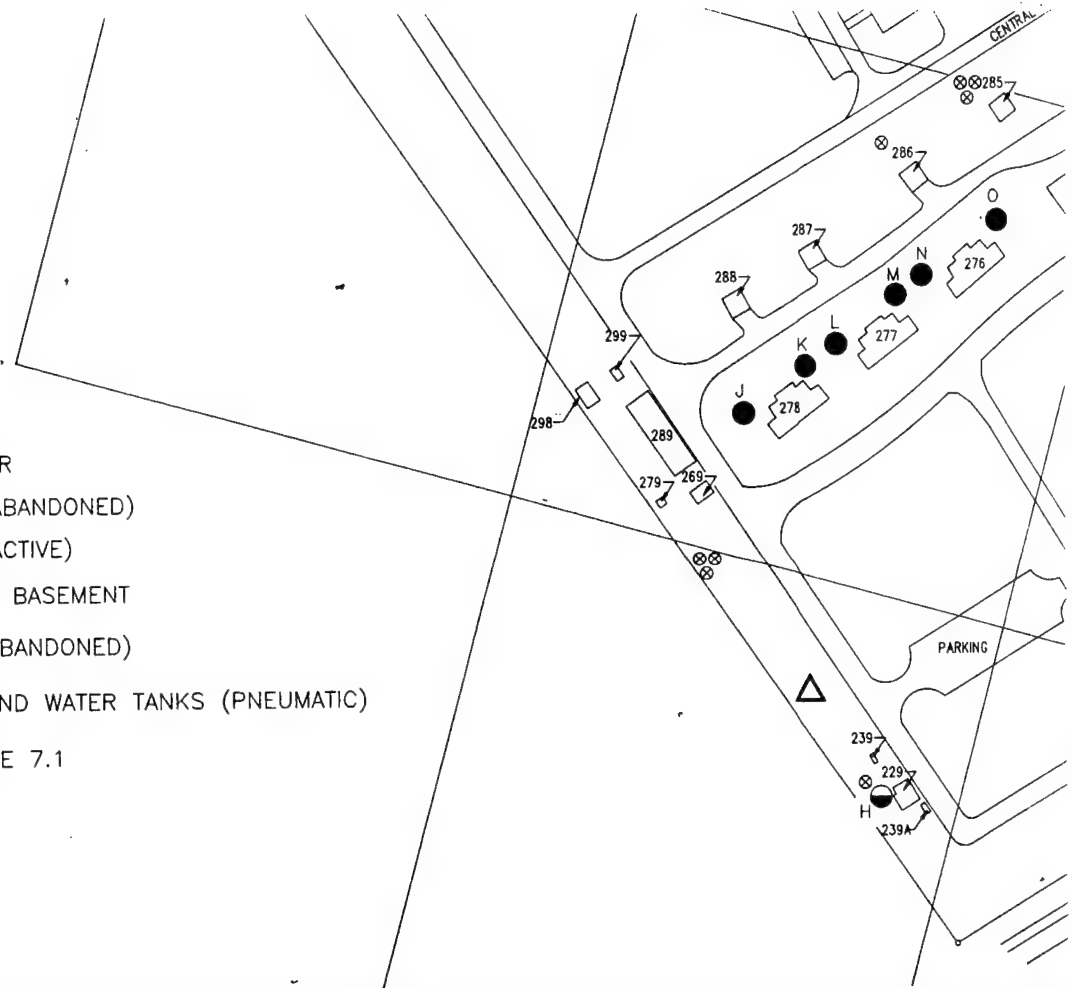
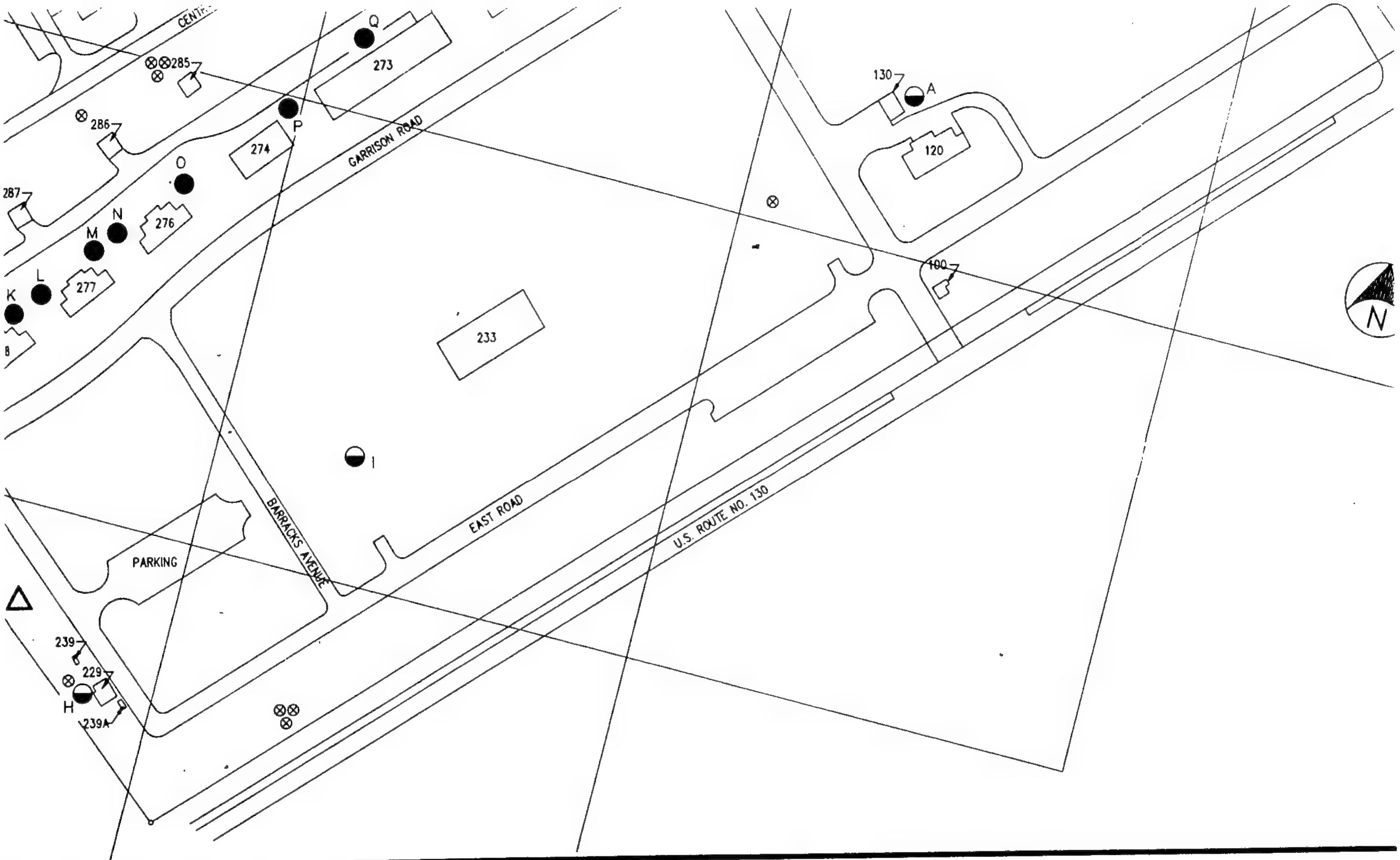
173
NORTH AVENUE
SALEM
COMMUNITY
COLLEGE
GPOLE
A
120
100
N

# LEGEND

- ⊗ ELECTRICAL TRANSFORMER
- ◒ UNDERGROUND TANKS (ABANDONED)
- ● UNDERGROUND TANKS (ACTIVE)
- ▲ ABOVE GROUND TANK IN BASEMENT
- △ ABOVE GROUND TANK (ABANDONED)
- ■ ABANDONED UNDERGROUND WATER TANKS (PNEUMATIC)
- AA LETTERS KEYED TO TABLE 7.1




Q
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GARRISON ROAD
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O
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K
L
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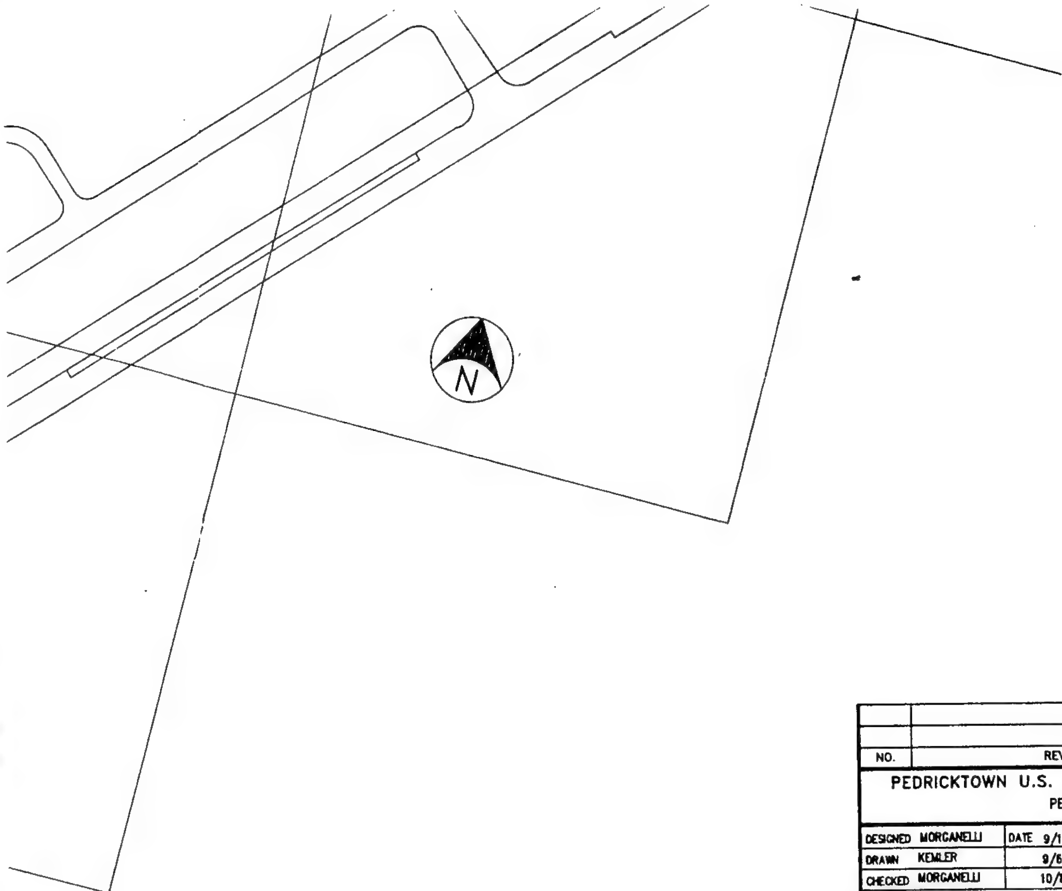
I
BARRACKS AVENUE
EAST ROAD
U.S. ROUTE NO. 130
PARKING
239
229
H
239A

5

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**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | |
|---|---|
| DESIGNED MORGANELLI | DATE 9/1/93 |
| DRAWN KEMLER | 9/6/93 |
| CHECKED MORGANELLI | 10/8/93 |

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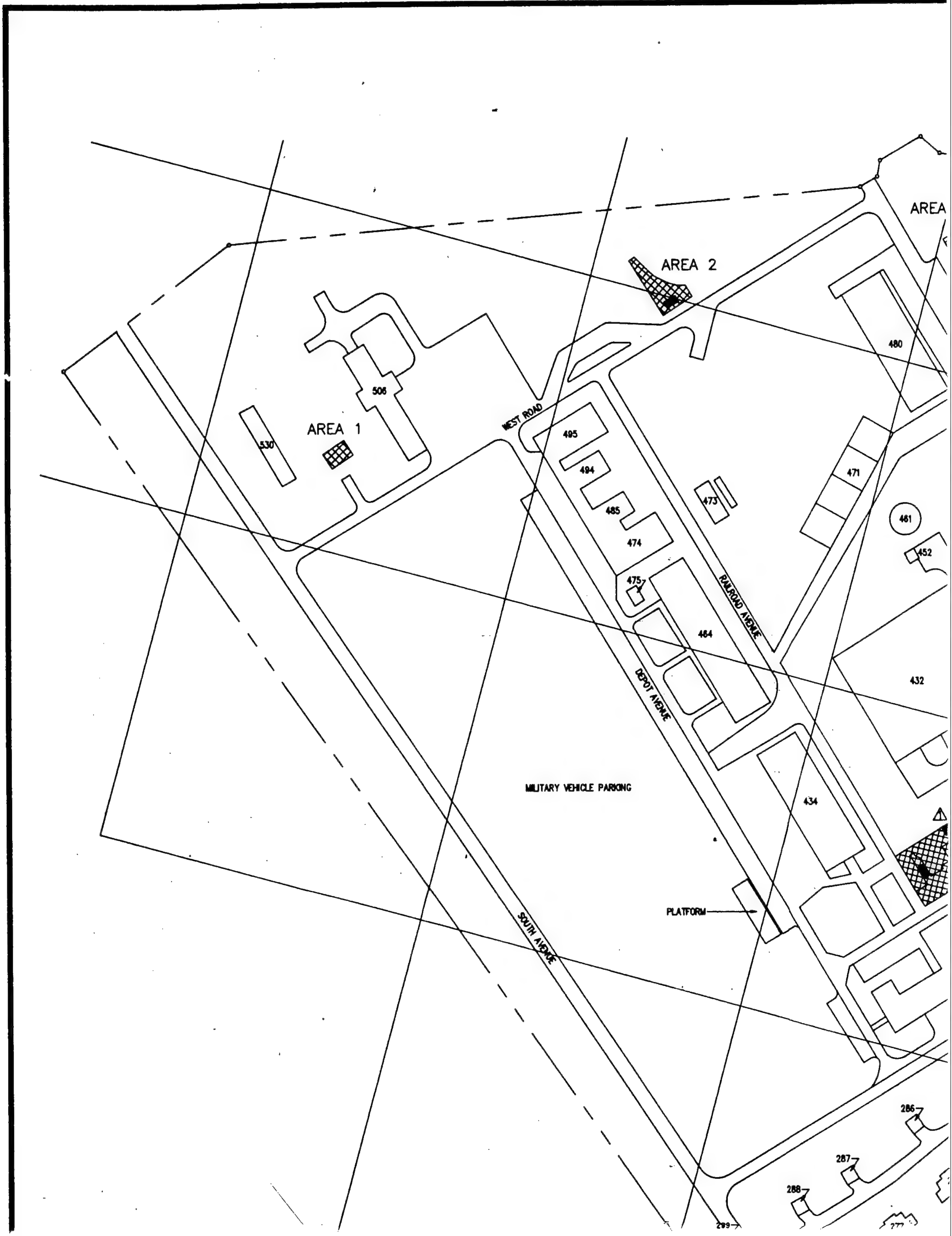
**FIGURE 7.1**
TANK AND TRANSFORMER LOCATION MAP

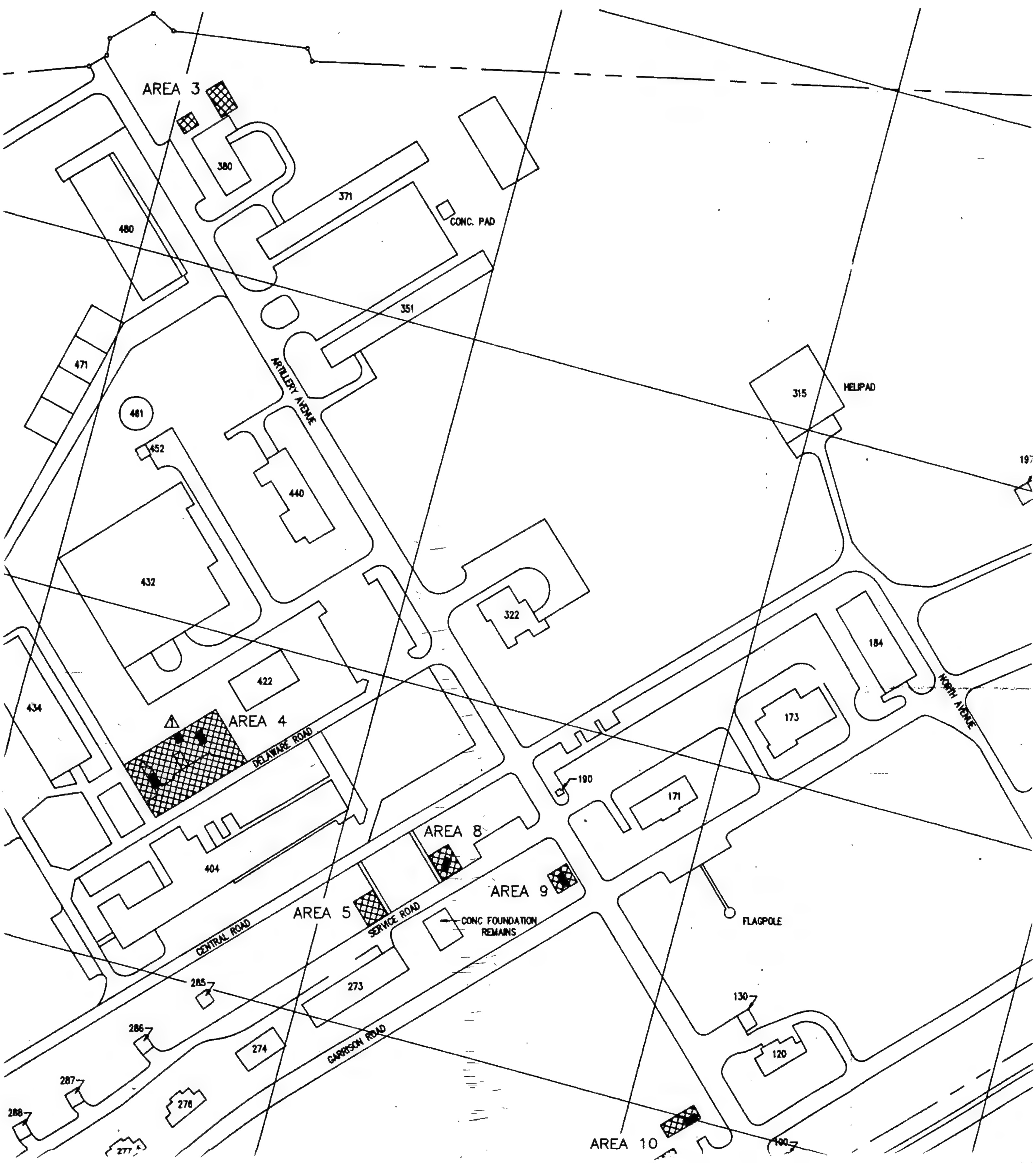
PROJECT NO. 2060.000 | SCALE NOTED

①



AREA
AREA 2
AREA 1
480
506
530
WEST ROAD
495
494
485
474
475
473
471
461
452
484
432
434
RAILROAD AVENUE
DEPOT AVENUE
MILITARY VEHICLE PARKING
PLATFORM
SOUTH AVENUE
286
287
288
289
277

(2)



AREA 3
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371
CONC. PAD
480
351
471
ARTILLERY AVENUE
481
452
440
315
HELIPAD
197
432
322
184
434
422
AREA 4
DELAWARE ROAD
173
NORTH AVENUE
190
171
AREA 8
404
AREA 9
AREA 5
SERVICE ROAD
CONC FOUNDATION REMAINS
FLAGPOLE
CENTRAL ROAD
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130
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GARRISON ROAD
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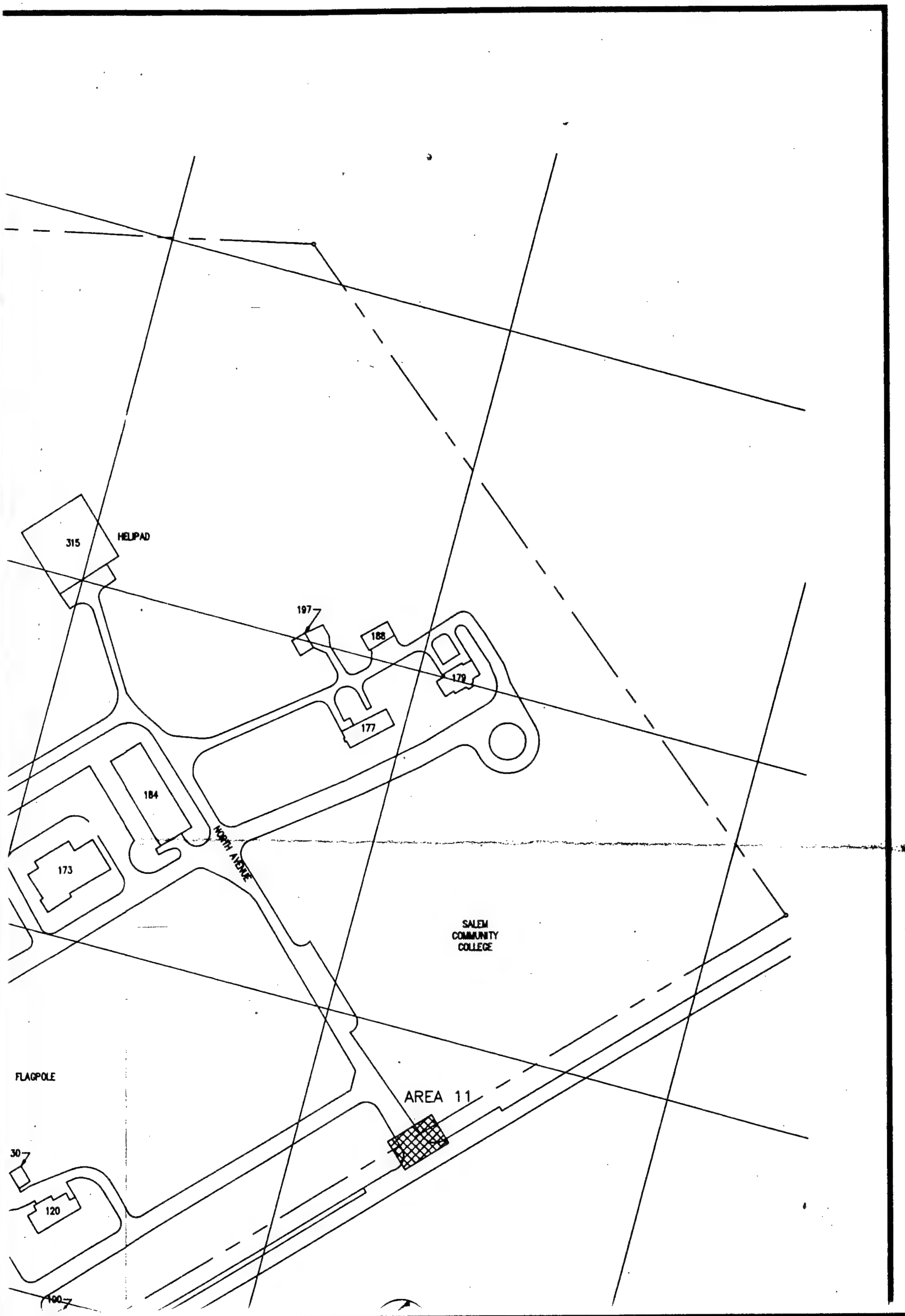
288
277
AREA 10



HELIPAD
315
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NORTH AVENUE
SALEM
COMMUNITY
COLLEGE
FLAGPOLE
AREA 11
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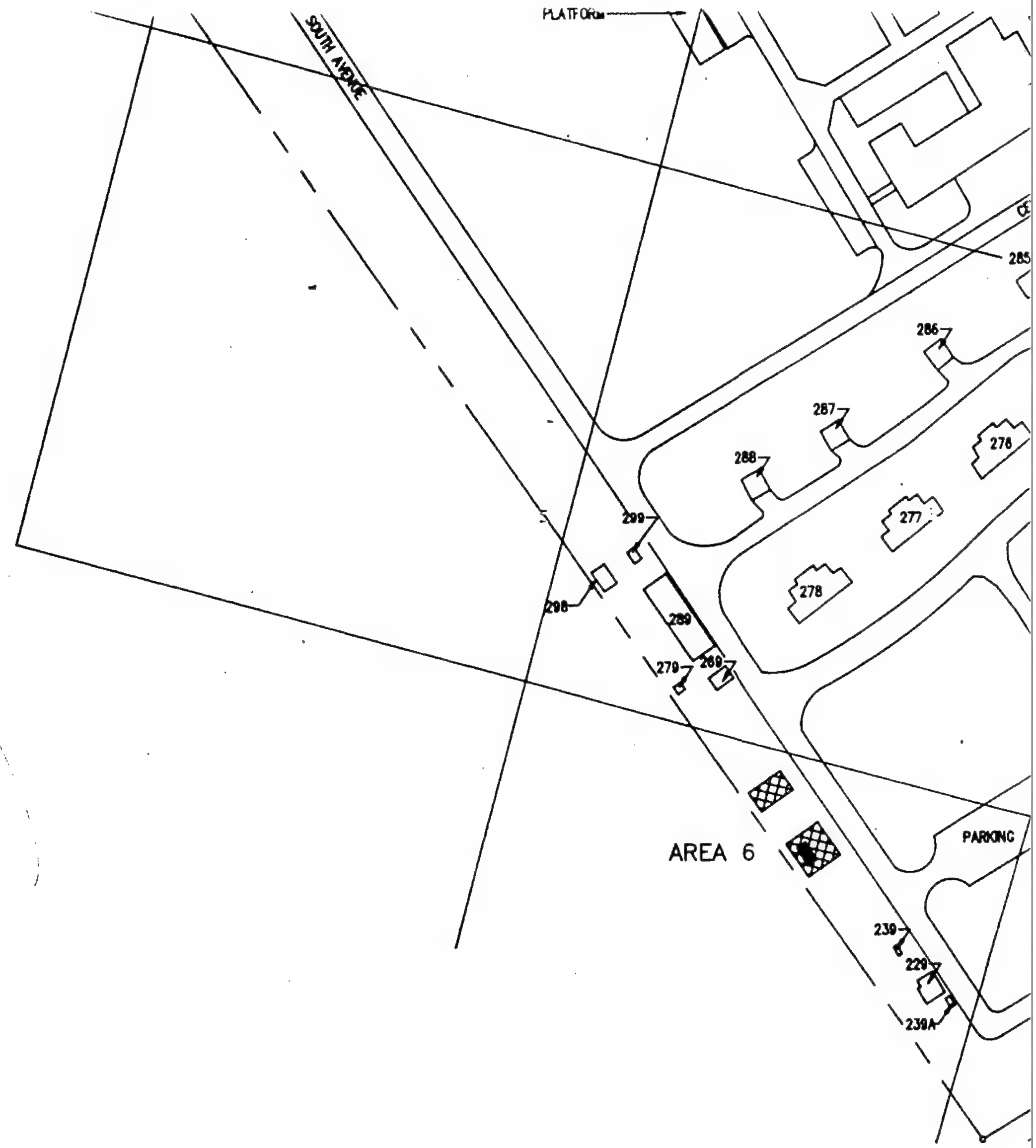
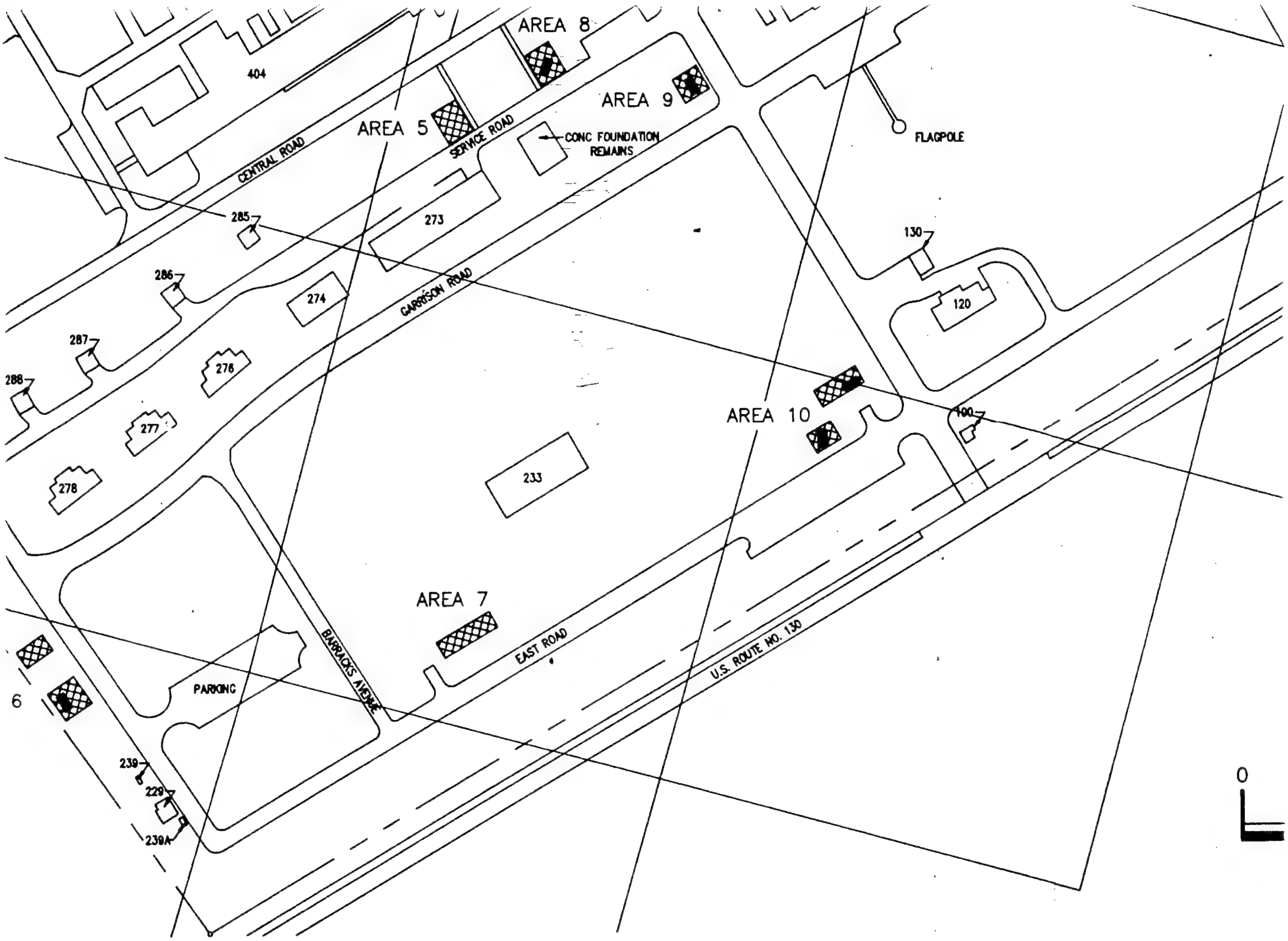



## LEGEND

- GPR SURVEY AREAS
- POSSIBLE LOCATION OF BURIED TANK, AS LOCATED BY GPR SURVEYOR.


AREA 8
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AREA 7
BARRACKS AVENUE
EAST ROAD
U.S. ROUTE NO. 130
PARKING
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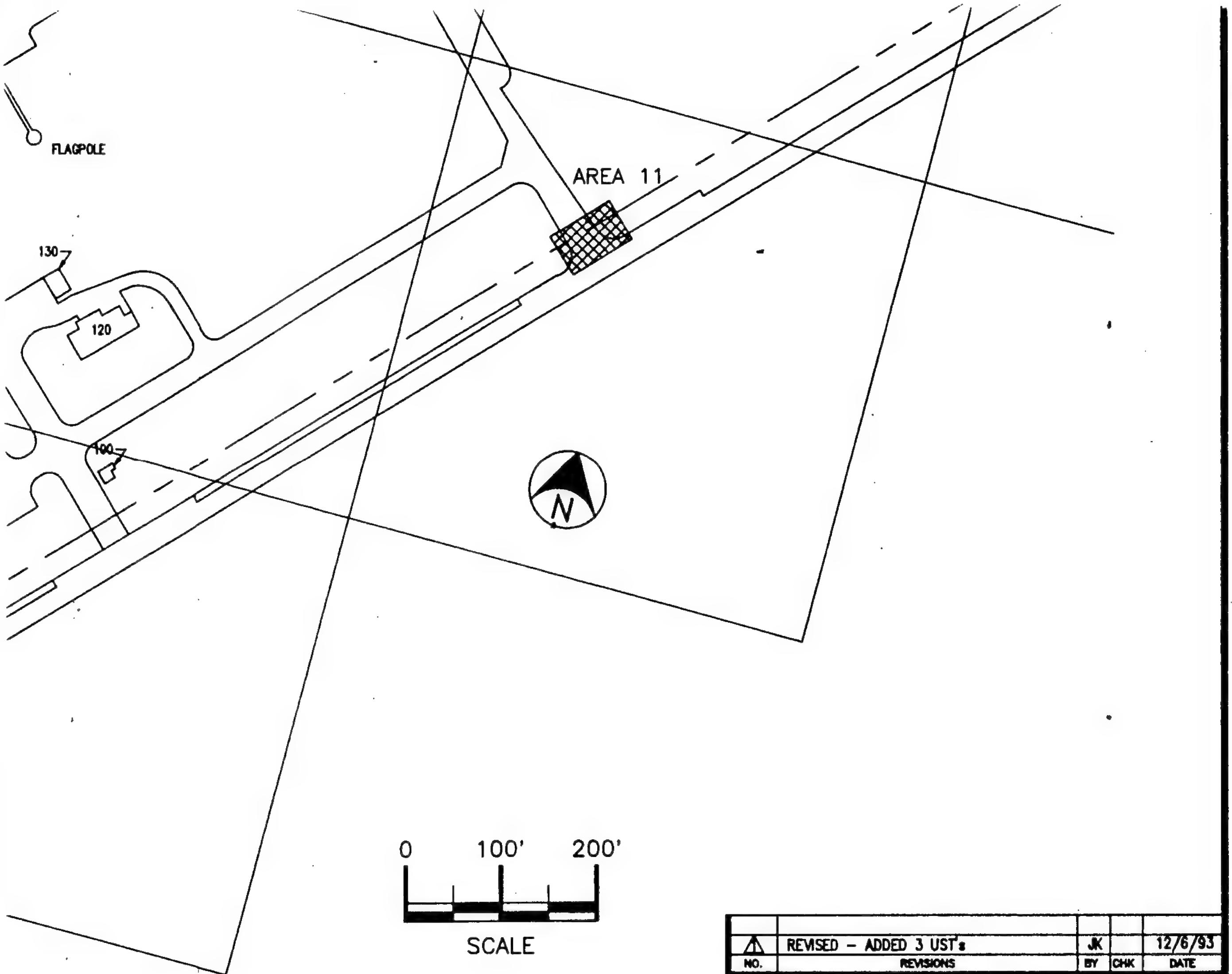


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| 1 | REVISED – ADDED 3 UST's | JK | | 12/6/93 |

**PEDRICKTOWN U.S. ARMY RESERVE SUPPORT FACILITY**
PEDRICKTOWN, NEW JERSEY

| | | | |
|---|---|---|---|
| DESIGNED | TRANTOW | DATE | 9/6/93 |
| DRAWN | KEMLER | | 9/15/93 |
| CHECKED | TRANTOW | | 9/30/93 |

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**FIGURE 7.2**
GROUND PENETRATING RADAR SURVEY MAP

PROJECT NO. 2060.000 SCALE NOTED

# 8.0 HEALTH AND ENVIRONMENTAL CONCERNS

## 8.1 Media Potentially Affected

The potential for contaminant distribution at PSF (and offsite), follow a natural pattern: from surficial and subsurface soil to groundwater, and from groundwater ultimately to surface water bodies and their sediments. Because the compounds found in the subsurface soils at PSF (metals and PAHs) generally are not highly mobile and will adsorb to soil particles, the potential for this migration is minimal. Surface soil contaminants (such as the arsenic found in the borings in the north-central portion of the site) have the potential to leach downwards to subsurface soils and even as far as the groundwater, as well as the potential to be carried away via overland runoff, to impact surface water and sediments. From comparison of the analytical data (Sections 4.2.5 and 4.2.6), it appears that the overland runoff migration pathway has been completed in the northwest area of PSF, and contamination has the potential to migrate further, along the north swale into the Delaware River. However, arsenic is an inorganic metal and is considered fairly immobile in the environment. Consequently, its migration along this pathway may have taken years to complete.

The primary migration pathway for surface water is from overland runoff and site drainages potentially to the Delaware River. Impacts to surface water also have the potential to impact their sediments and vice versa. Based on the high volumetric flow differential between the swale and the river, contaminants found at PSF which may travel along the north swale to the river would be diluted and therefore become relatively insignificant.

Impacts to groundwater at PSF may potentially affect not only downgradient subsurface soils, but the surface water bodies with which the groundwater is hydraulically connected. Groundwater flow at the site is to the west-northwest, flowing from the site towards the Delaware River. A small portion of the groundwater flowing through the aquifer discharges to the north swale and perhaps also the marsh areas found on-site in the vicinity of the swale. The remaining groundwater flows under the swale, under the dredged materials at Pedricktown South, and under the Holocene alluvium, into the Delaware River. Any impacts to the groundwater at PSF, therefore, could potentially impact the remaining portions of the Cape May aquifer underneath the dredged materials, as well as the sediments and surface water in the north swale and in the river. However, no significant contaminant concentrations were found in this media at PSF.

## 8.2 Preliminary Human Health Risk Assessment

This section presents a preliminary assessment of human health risks posed by the chemicals found at PSF. This preliminary risk assessment was intended to provide the most conservative estimate of future potential human health risks by considering exposure of the most sensitive population (children) to the most contaminated site medium (soil) via the most conservative route of exposure (ingestion).

### 8.2.1 Scope of the Preliminary Risk Assessment

This preliminary human health risk assessment considered scenarios for future exposure of children residing near PSF. It was conducted using the EPA guidance provided by *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluations Manual* (RAGS) (EPA 1989a). As a preliminary risk assessment, it included only some of the steps generally included in a baseline human health risk assessment.

The exposure assessment component of this risk assessment included reasonable maximum exposure estimates for future land use. This future exposure estimate was intended to provide decision-makers with an understanding of the most conservative potential future risks of chemicals found at PSF. This risk assessment does not present potential health risks currently posed by the site.

### 8.2.2 Media of Potential Concern

Samples of surface water, groundwater, surface soil, subsurface soil and sediments in the storm sewer system were analyzed for potential chemicals of concern. Based on these analyses, the sediment was found to be the most contaminated medium, and surface soil was found to be the second most contaminated medium at this site. However, because most of the storm sewer system is underground and not accessible to the general public, exposure to sediments is not likely. Therefore, surface soil was considered to be the primary medium of concern at this site.

### 8.2.3 Data Evaluation

The limitations and uncertainties associated with the analytical results were evaluated as part of the data reporting requirements of the laboratory conducting the analyses. Only data validated according to the guidelines established within the USAEC QA Program were used in this preliminary risk assessment. Analytical data-related qualifiers identified by the laboratory were taken into consideration in the validation process. Background soil samples were examined to identify naturally

occurring levels of chemicals and representative ambient concentrations resulting from off-site sources.

Before the chemicals of potential concern were selected, the frequencies of detection, the maximum detected concentrations, and the arithmetic averages of the surface soil samples were calculated. Not all chemicals were detected in all soil samples. If a given chemical was detected in some, but not all, of the samples, then for the samples that did not exceed the detection limit, one-half the sample detection limit was used for calculating that chemical's arithmetic mean. This procedure was followed to account for the possibility that one or more chemicals of potential concern might have been present in a given sample at levels below their sample detection limits.

The statistical calculations for evaluating the chemicals of potential concern in the surface soils are found in Table 8.1. The RAGS guidance requires an upper 95% confidence limit on the arithmetic mean to be calculated and used to determine intake concentrations. In this risk assessment, instead of the 95% limit, the maximum detected concentrations were used in the intake calculations in order to obtain the most conservative exposure estimate.

This risk assessment addressed only site-related chemicals considered significant potential threats to human health. Chemicals of potential concern were selected based on a combination of their intrinsic toxicities and their levels of occurrence on-site. To determine the chemicals of potential concern, procedures prescribed in RAGS (EPA 1989a) were followed:

- If a chemical was not detected in any surface soil samples, that chemical was eliminated from consideration as a chemical of potential concern.
- If a detected chemical was a class A or B carcinogen, it was considered to be a chemical of potential concern and retained for evaluation.
- Concentrations of inorganic chemicals that exceeded their sample detection limits were compared to background sample data to determine if the chemicals were naturally occurring or resulted from releases from site-related human activities. A given inorganic chemical was determined to be a chemical of potential concern if the arithmetic mean concentration of the chemical in the on-site surface soil exceeded its background soil arithmetic mean concentration by a factor of two or more. (It must be noted that previous data evaluation discussions in Sections 3.0, 4.0 and 5.0 compared individual chemical compound concentrations to 2 times background, and not the arithmetic mean concentration to 2 times background as was used here in the risk assessment portion of this ESI.) Because of the few available background samples, a statistical analysis was not rigorous. The statistical analysis would determine that the site

results are not significantly different from background, and therefore, no chemicals should be selected as chemicals of potential concern. To establish a more rigorous method of comparing site concentrations with background results, a conservative approach of comparing site concentrations to 2 times background average was adopted (per memo to the Army Environmental Hygiene Agency, September 27, 1993).

- Individual human nutrients were selected as chemicals of potential concern only if the estimated ingestion of these nutrients, using EPA-recommended body weight values, would exceed the National Research Council's (NRC) Recommended Dietary Allowances (RDAs), Estimated Safe and Adequate Dietary Intakes, or Estimated Minimum Requirements for Healthy Persons (NAS 1989). These NRC recommended intakes for children are listed below:

NRC Recommended Intakes (mg/day)

| Nutrient | Child |
|---|---|
| Calcium | 800 |
| Chromium | 0.12 |
| Copper | 1.5 |
| Molybdenum | 0.075 |
| Potassium | 1,400 |
| Selenium | 0.02 |
| Zinc | 10 |

- Those chemicals that were only tentatively identified in the EPA's analytical Target Compound List (TCL) and Target Analyte List (TAL) were also excluded from further consideration.

- Some polycyclic aromatic hydrocarbons (PAHs) usually associated with petroleum hydrocarbons were evaluated as chemicals of concern.

- TPH was not included in the risk evaluation because there is no health based toxicity criteria or EPA MCL set for TPH. TPH analysis is somewhat general in nature and includes many different hydrocarbons, thus a single toxicity value has not been decided upon.

The chemicals of potential concern for the surface soils at this site are listed in Table 8.2.

8.2.4 Human Exposure Assessment

Exposure bridges the gap between a potential hazard and a risk. The objectives of an exposure assessment are to: (1) identify populations that may potentially be exposed to the chemicals of concern, (2) identify the pathways by which such exposures may occur; and (3) quantify chemical intakes, or potential doses, based on the magnitudes, frequencies and durations of these potential exposures. The exposure assessment thus provides pathway-specific intakes for exposures to site-related chemicals of concern.

8.2.4.1 Potentially Exposed Populations

This risk assessment focused on the most conservative exposure scenario. Future land use scenarios considered for exposure to on-site surface soils included residential, recreational, commercial, and construction activities. Of these activities, the future residential use exposure scenario was considered to be the most conservative because the exposure frequencies and durations extended over a longer period of time than those considered for the recreational, commercial, or construction scenarios.

Because of a combination of the tendency of residential children to ingest considerable amounts of soil and their lower body weights, children were considered the most susceptible population of concern for surface soil at PSF.

8.2.4.2 Potential Exposure Pathways

The potential human exposure pathways at the site included those from surface water, sediment, surface soil, subsurface soil, and groundwater. However, as discussed in Section 8.2.2, the surface soil was considered to be the most contaminated site medium, having the most significant pathway for exposure to children. Of the various routes (ingestion, inhalation, or dermal exposure), ingestion of surface soil by future residential children was considered to offer a more conservative estimate of exposure.

8.2.4.3 Calculation of Chemical Intake

The equation used to estimate the intake of site-related chemicals by residential children was recommended in RAGS (EPA 1989a) (Table 8.3). The equation estimating incidental ingestion of surface soil is:

$$I = \frac{C_s \times IR \times EF \times ED \times CF}{BW \times AT}$$

where:

| | | |
|---|---|---|
| I | - | intake (mg/kg-day), |
| $C_s$ | - | maximum detected chemical concentration in surface soil (mg/kg), |
| IR | - | ingestion rate (mg soil/day), |
| EF | - | exposure frequency (days/year), |
| ED | - | exposure duration (years), |
| CF | - | conversion factor (1E-6 kg soil/mg soil), |
| BW | - | body weight (kg), and |
| AT | - | period of time over which exposure is averaged (days). |

The maximum detected concentrations of the chemicals found in the surface soil samples were used as the most conservative intake estimates. An ingestion rate (IR) of 200 mg/day for children was used because the EPA considered this ingestion rate representative of the upper-bound values for soil ingestion (EPA 1991a). The EPA recommends that an exposure frequency (EF) of 350 days/year (i.e., year round exposure) be used in soil ingestion scenarios because of the uncertainty associated with the relative contribution of soil versus dust to exposure via ingestion, and to the effect of climatic variations (EPA 1991a). A body weight (BW) of 15 kg is recommended by EPA as a default value because it is representative of the average weight for children (EPA 1991a). Exposure duration (ED) was assumed to be 6 years for children (EPA 1991a). The noncarcinogenic averaging time was 6 years (2,190 days) and the carcinogenic averaging time was assumed to be 70 years (25,550 days) (EPA 1991a).

#### 8.2.4.4 Toxicity Assessment

Introduction and Approach: The purpose of the toxicity assessment is to evaluate available evidence regarding the potential for chemicals in the surface soil to cause adverse human health effects in the future exposure scenario involving residential children. The toxicity assessment is combined with the exposure assessment to estimate the carcinogenic and noncarcinogenic adverse health effects.

The two toxic responses considered by the EPA are noncarcinogenic (threshold) and carcinogenic (non-threshold) effects. The two principal indices of toxicity for these responses are Reference Doses (RfDs) and carcinogenic Slope Factors (SFs). The RfDs and SFs for the chemicals of potential concern in the surface soil are presented in Table 8.4 and were obtained from the following sources:

- EPA's Integrated Risk Information System (IRIS)(EPA 1993b)
- Health Effects Assessment Summary Tables (HEAST)(EPA 1993a)
- EPA Region III Risk Based Concentration Table (EPA 1993c).

Toxicity Assessment for Noncarcinogenic Effects: In developing toxicity values for noncarcinogenic effects, the approach is to identify threshold doses or Reference Doses for all chemicals of potential concern. An RfD for a given substance is defined by the EPA as the daily intake or dose per unit body weight (mg/kg/day) of that substance that is likely to be without appreciable risk to human populations, including sensitive subgroups, over a normal lifetime. The RfD for a given chemical is obtained by dividing the most appropriate no-observed-adverse-effect-level (NOAEL)

or Low-Observed-Adverse Effect Level (LOAEL) for that chemical by EPA designated uncertainty and modifying factors. The NOAELs and LOAELs are usually obtained from toxicity findings in experimental animals and the uncertainty and modifying factors are intended to account for specific types of uncertainty inherent in deriving a single estimate of toxicity from the available data, including variations in the sensitivity of individuals in a population, extrapolation from animal data to humans, and other limitations.

The EPA has developed RfDs for different exposure routes and durations of exposure (i.e., chronic, subchronic). The EPA considered chronic RfDs appropriate for use of noncarcinogenic effects associated with exposure periods longer than 7 years. A few subchronic RfDs have also been developed by the EPA to characterize potential noncarcinogenic effects associated with shorter term exposures (i.e., periods between 2 years and 7 years). Subchronic RfDs tend to be higher than chronic RfDs because of assumed shorter exposure durations. Therefore, identification of appropriate toxicity values must reflect length of potential exposures. For this assessment, subchronic RfDs are used because residential children are assumed to be exposed to noncarcinogens for 6 years.

Toxicity Assessment for Carcinogenic Effects: In assessing the risk of carcinogens, it is common practice for the EPA and other regulatory agencies to assume that any exposure level, however small, poses a finite probability of producing a carcinogenic response. The EPA uses a two-part evaluation in which the substance is first assigned a weight-of-evidence classification. Then a slope factor is calculated that defines quantitatively the relationship between dose and response. The EPA's weight-of-evidence classification is based on the extent of evidence that chemicals are carcinogenic in humans and experimental animals.

A number of mathematical models and procedures have been developed to extrapolate from carcinogenic responses observed at high doses in experimental animals to responses expected at low doses in humans. EPA uses the linearized multistage model for low-dose extrapolation. This mathematical model is based on the multistage theory of carcinogenesis where the response is assumed to be linear at low doses. EPA further calculates the upper 95th percent confidence limit of the slope of the resulting dose-response curve. The value is known as the slope factor. The slope factor, as developed by EPA, converts the average daily intake of chemical during a lifetime directly to a cancer risk. The slope factor is expressed in units of $(mg/kg/day)^{-1}$.

### 8.2.5 Risk Characterization

In risk characterization, the results of the carcinogenic and non-carcinogenic toxicity assessments (SFs and RfDs) and exposure assessment (chemical intakes) are integrated to arrive at quantitative estimates of carcinogenic risks and hazard indices.

#### 8.2.5.1 Quantification of Risks and Hazards

Hazard Index for Noncarcinogenic Effects: The potential for noncarcinogenic health effects from a given chemical, expressed as a Hazard Quotient, was determined using the following calculation:

$$HQ = \frac{SDI}{RfD}$$

where:

| | | |
|---|---|---|
| HQ | = | chemical-specific hazard quotient (unitless), |
| SDI | = | subchronic daily intake (mg/kg/day), and |
| RfD | = | reference dose (mg/kg/day). |

Individual chemical Hazard Quotients are summed as a Hazard Index (HI). If an HQ is less than one, the chemical-specific hazards are not considered a threat to public health, including sensitive populations. Hazard Indices greater than one are considered to represent a public health concern in the regulatory realm. Because this risk evaluation is for a future risk scenario at PSF, HI values greater than one still do not indicate a current public health threat.

Carcinogenic Risks: Carcinogenic risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to potential carcinogens. The numerical estimate of excess lifetime cancer risk is calculated by multiplying the chronic (lifetime) daily intake (CDI) by the risk per unit dose of cancer slope factor (SF) as follows:

$$\text{Cancer } Risk = CDI \times SF$$

where:

| | | |
|---|---|---|
| Risk | = | likelihood of developing cancer from lifetime exposure (70 years) expressed as unitless probability, |
| CDI | = | chronic daily intake of a substance averaged over a lifetime (mg/kg/day), and |
| SF | = | slope factor $(mg/kg/day)^{-1}$. |

The difference between SDI and CDI is basically a difference in duration. CDI is exposure expressed as mass of a substance contacted per unit body weight per unit time, averaged over 7 years to a lifetime (under Superfund guidance). SDI is exposure expressed as mass of a substance contacted per unit body weight per unit time, averaged over 2 weeks to 7 years (under Superfund guidance).

EPA guidance to evaluate risk from simultaneous exposure to several carcinogens assumes that incremental cancer risks are additive. The concept that cancer risks are additive is based on a number of assumptions. If these assumptions are incorrect, over- or under- estimation of the actual risk could result (EPA, 1989a). The total cancer risk is estimated as the sum of the individual chemical-specific risks.

EPA policy must be considered in order to interpret the significance of the cancer risk estimates. In the National Oil and Hazardous Substances Contingency Plan (NCP) (40 CFR Part 300), EPA states that: "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1E-4 to 1E-6." The Agency further states in the preamble to the NCP that the 1E-6 risk level be used as a point of departure for establishing remediation goals for the risks from constituents at Superfund sites.

8.2.5.2 Characterization of Hazard Indices and Carcinogenic Risks

The noncarcinogenic hazards and carcinogenic risks were calculated for incidental ingestion of surface soils at PSF by future residential children as described previously.

Noncarcinogenic Hazards: The chemicals of potential concern were evaluated to determine whether they potentially have noncarcinogenic effects on future residential children. The results of these calculations are found in Table 8.5. The only chemical-specific hazard quotient that is greater than one is for arsenic with an HQ of 1.49. Also, arsenic contributes 95.5 percent of the total hazard from the surface soils. Thus, the surface soils at this site may pose significant adverse health effects to future residential children.

Carcinogenic Risks: The chemicals of potential concern were also evaluated to determine whether they may potentially have carcinogenic impacts on future residential children. The results of these calculations are found in Table 8.6. The total carcinogenic risk from the surface soils on residential children is within

EPA's target range of 1E-6 to 1E-4 with a risk of 7.79E-5, but is above NJDEPE's recommended risk level of 1E-6.

### 8.2.6 Uncertainties and Limitations of Risk Assessment

Despite recent advances in risk assessment methodology, uncertainties are inherent in the risk assessment process. In order to appreciate the limitations and significance of the risk estimates, it is important to have an understanding of the sources and magnitudes of uncertainties associated with them. Sources of uncertainty in this risk assessment, as in any risk assessment, include:

- Sampling and analysis
- Chemical transport and fate
- Toxicity data
- Exposure assessment
- Risk estimates

Environmental Media Sampling and Analysis: Sampling was conducted using accepted procedures in an attempt to collect samples that were representative of environmental media. Analyses were performed in accordance with the USAEC QC Program procedures. Data were subsequently reviewed in a data validation process. However, current analytical procedures may not identify all potentially hazardous contaminants at a site, and analytical errors may have occurred despite stringent QA/QC procedures. In conducting this risk assessment, it was assumed that the reported chemical concentrations were representative of actual site conditions.

Surface soils were sampled in the interval of 0-2 feet bgs. Accurate determination of human health risks only requires data from 0-6 inches bgs (the layer which is most likely to be ingested by a child or dermally contacted by residents/workers). Therefore, the comparison of surface soil samples at PSF to health risk concentrations, was not a completely equivalent comparison.

Chemical Transport and Fate: The maximum detected concentrations of chemicals of potential concern found in the surface soil on site were used as exposure point concentrations. Migration, dispersion, dilution, retardation, degradation, and other attenuation or transformation processes may occur over time that could change the chemical concentrations in the surface soils.

Toxicity Data: For many of the chemicals of concern found at the Pedricktown site, there are limited available scientific data on subchronic toxic effects in humans. Consequently, varying degrees of uncertainty surround the assessment of

adverse health effects in potentially exposed populations. Sources of uncertainty for toxic effects in humans include:

- Use of dose-response data from experiments on homogeneous, sensitive animal populations to predict effects in heterogeneous human populations with a wide range of sensitivities
- Extrapolation of data from high doses in animals to "real-world" low doses, from acute or subchronic to chronic exposure, and from one route to another, e.g., from ingestion to dermal absorption
- Use of single chemical data that do not account for possible antagonistic or synergistic responses from multiple chemical exposures

Toxicity data are largely derived from laboratory animals. Experimental animal data have historically been relied upon by regulatory agencies and other expert groups to assess the hazards of chemicals to humans. Even though this reliance has been supported by empirical observations, there may be slight or marginal interspecies differences in the absorption, metabolism, excretion, detoxification, and toxic responses to specific chemicals of concern. There may also be uncertainties concerning the relevance of animal studies using exposure routes that differ from human exposure routes. In addition, the frequent necessity to extrapolate results of short-term or subchronic animal studies to humans exposed over a lifetime has inherent uncertainty. In order to adjust for many of these uncertainties, EPA often adjusts the RfD for noncarcinogenic effects using uncertainty and modifying factors on the most sensitive animal species.

There is also uncertainty as to whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animals, but not in others, raises the possibility that not all animal carcinogens are carcinogenic in humans. EPA assumes that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimating risk, may introduce the potential to overestimate carcinogenic risk for some chemicals.

The model used by EPA to determine slope factors is the linearized multistage model that provides a conservative estimate of cancer risk at low doses and may overestimate the actual slope factor. Inadequate knowledge of the validity and accuracy of the linearized multistage model may increase the uncertainty and the tendency to overestimate actual cancer risks.

When dealing with exposures to chemical mixtures, EPA assumes dose additivity and does not account for potential synergisms, antagonisms, differences in target organ specificity, or mechanisms of action.

Despite these many limitations, animal experiments are widely believed to be a necessary part of toxicity assessment, especially in the absence of human epidemiological data. The safety factors used in RfD derivations for single chemicals may compensate for any unknown effects of synergistic exposures.

Exposure Assessment: Exposure assessment is perhaps the most critical step in achieving a reliable estimate of health risks to humans. In this assessment, a number of assumptions were made concerning the human populations that could come into contact with the surface soils at PSF and the frequencies and durations of these contacts. The exposure parameters used in this assessment were largely based on EPA's RAGS (EPA 1989a) and Exposure Factors Handbook (1989b), and may not be representative of future receptor populations. There is also the presumption that interim and institutional measures at the site would not lead to changes in exposure conditions and receptor behaviors. The exposure assessment is based on future exposure patterns not currently occurring.

The statistical calculations for evaluating the chemicals of potential concern in the surface soils are based on more conservative values than normally required. The RAGS guidance requires an upper 95% confidence limit on the arithmetic mean to be calculated and used to determine intake concentrations. In this risk assessment, instead of the 95% limit, the maximum detected concentrations were used in the intake calculations and thus, more conservative exposure estimates were utilized.

Assumptions were also made during the selection of chemicals of potential concern. Using the conservative approach of comparing the maximum detected concentration for inorganics in the site soil to 2 times background average may incur additional uncertainties.

In accordance with EPA Headquarters guidance, reasonable maximum exposures were calculated to provide estimates of potential exposures. Because reasonable maximum exposure estimates are based on a combination of conservative assumptions, these estimates are likely to be overestimates of exposures and risks at the PSF site.

Risk Estimates: The actual risks associated with a given exposure result from a complex set of interactions which are not understood and cannot be quantitatively estimated at the current state of knowledge. Examples of such interactions include

synergism or antagonism of different substances, effects on single versus multiple organ systems, and mechanisms of carcinogenesis. In addition, potential differences in sensitivities of various subpopulations to various chemicals are poorly understood at this time.

Because there may be small individual uncertainties at each step of the risk assessment process, these uncertainties may become magnified in the final risk characterization. The final quantitative estimates of risk may be as much as an order of magnitude different from the actual risk associated with a given site. In an attempt to minimize the consequences of uncertainty, Agency guidance typically relies upon use of conservative estimates of hazard in the absence of comprehensive appropriate data. The overall result is that risk estimates presented in this report are more likely to overestimate the potential future risks than to underestimate them.

This assessment has been prepared in a manner consistent with that generally used in the consulting community and Agency guidance at the time it was prepared. It is likely that risk assessment methods and the data identifying and quantifying the toxicity of chemicals will improve with time. Consequently, unsuspected hazards at this site may be identified at a later date. This assessment was based upon available data, using currently available risk assessment methodology.

### 8.3 Hazard Ranking System Scoring

The PSF ESI was performed in part to support Hazard Ranking System (HRS) scoring of the facility to determine the potential NPL candidacy of the site. The site score was calculated using the U.S. EPA's PREscore program, Version 2.0. The program was equipped with toxicological data updated in 1993.

Wherever possible, hard data were used in assessing the PSF site. When hard data were not available, reasonable estimates and values were assigned based on acquirable information. The level of effort exerted in attempting to locate hard data was directly related to the potential impact of the data on the site score. In all cases, estimates were conservative. The U.S. EPA's Hazard Ranking System Guidance Manual provided direction on establishing reasonable estimated values and on evaluating hard data from a scoring perspective. HRS scoresheets, documentation of scoring strategies and reasoning, and references for the HRS are provided in Appendix J.

Two sources were identified based on ESI activities; a 1,000-gallon waste oil tank and a 3.7-acre area of soil contamination at the northwest corner of the PSF site. Tetrachloroethene was identified as the primary contaminant related to the tank, and metals were the primary contaminants associated with contaminated soils. According to HRS protocol, the site relatedness of contaminants was determined by comparing contaminant concentrations to three times the background concentrations measured at the site.

An HRS site score of 9.63 was attained for the PSF site. A summary of the individual pathway scores is provided in Table 8.7. The primary contributing factor for all pathways was the low waste characteristics values attained for the site. The two identified sources at PSF carried low hazardous waste quantity values due to their size and extent, resulting in low waste characteristics values. An increase of two orders of magnitude in hazardous waste quantity values for the sources would be required to realize an increase in the site waste characteristic values.

The Groundwater Migration Pathway achieved the highest pathway score (16.2). An observed release is documented via this pathway. Groundwater sampling downgradient of the waste oil underground storage tank revealed tetrachloroethene contamination (26 ppb). There are no on-site drinking water wells, and there is no documentation of the contamination affecting off-site wells. Groundwater is the exclusive source of drinking water in the area of PSF. However, the area is not heavily populated, and target populations are relatively low.

Two components of surface water migration were evaluated, Surface Water Overland/Flood Migration and Groundwater to Surface Water Migration. The groundwater to surface water component was calculated by PREscore based on data input for the groundwater migration pathway and overland/flood migration component. A score of 2.0 was calculated for the groundwater to surface water component of the surface water pathway. Therefore, the Overland/Flood Migration Component score (9.93) is considered the Surface Water Migration Pathway score.

The low Surface Water Migration Pathway score is the result of a number of factors, including no observed release and minimal targets. There are no drinking water intakes within the target distance limit (TDL) of 14 miles on the Delaware River. The Delaware River supports primarily subsistence and recreational fishing over the TDL. Therefore, the environmental threat represents the only scoring portion of the surface water pathway, due to the identification of wetlands and

wildlife refuges within the TDL. However, the environmental threat score remained low because no actual contamination of a sensitive environment was documented.

The Air Pathway also scored low (3.41) due to limited targets and a moderate potential to release. The area of the PSF is not heavily populated, and the potential for a release is limited by source type and site characteristics.

A very low score was obtained for the Soil Exposure Pathway (0.60). Minimal target populations are evident because residential properties are not affected by contamination at the PSF site. Nearby populations are not large enough to significantly increase the pathway score.

In summary, the PSF site HRS score of 9.63 is the result of low waste characteristics values and limited targets for site related contaminants. The site HRS score is well below the 28.5 score used by the EPA to consider sites for inclusion on the NPL.

Table 8.1
STATISTICAL EVALUATION FOR THE SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOUND IN SURFACE SOIL SAMPLES
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Frequency of Detection | Percentage Detected (%) | Average Concentration (µg/g) | Maximum Detected Concentration | Background Average Concentration | 2x Background Average | Comparison to Background | Comparison to 2x Background | Carcinogenic Class | Evaluate In Risk Assessment? |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 7/19 | 37 | 0.038 | 0.193 | 0.020 | 0.04 | YES | NO | D | NO |
| Lead | 19/19 | 100 | 29.719 | 220.000 | 25.770 | 51.54 | YES | NO | B2 | YES* |
| Thallium | 1/19 | 5 | 0.083 | 0.204 | 0.109 | 0.22 | NO | NO | D | NO |
| Arsenic | 19/19 | 100 | 9.881 | 35.000 | 2.323 | 4.65 | YES | YES | A | YES |
| Selenium | 13/19 | 68 | 0.877 | 5.400 | 0.101 | 0.20 | YES | YES | D | YES |
| Aluminum | 19/19 | 100 | 4650.526 | 11,000.000 | 3,560.000 | 7120.00 | YES | NO | NA | NO |
| Iron | 19/19 | 100 | 9197.895 | 29,000.000 | 6,740.000 | 13480.00 | YES | NO | NA | NO |
| Magnesium | 19/19 | 100 | 931.474 | 2840.000 | 504.000 | 1008.00 | YES | NO | NA | NO |
| Manganese | 19/19 | 100 | 159.026 | 966.000 | 89.300 | 178.60 | YES | NO | D | NO |
| Molybdenum | 6/19 | 32 | 1.043 | 3.370 | 0.500 | 1.00 | YES | YES | NA | YES |
| Nickel | 18/19 | 95 | 7.250 | 27.100 | 3.720 | 7.44 | YES | NO | NA | NO |
| Potassium | 19/19 | 100 | 411.684 | 1,230.000 | 192.833 | 385.67 | YES | YES | NA | YES |
| Silver | 4/19 | 21 | 0.501 | 2.910 | 0.261 | 0.52 | YES | NO | D | NO |
| Sodium | 19/19 | 100 | 111.874 | 258.000 | 75.133 | 150.27 | YES | NO | NA | NO |
| Titanium | 19/19 | 100 | 112.453 | 583.000 | 66.067 | 132.13 | YES | NO | NA | NO |
| Barium | 19/19 | 100 | 70.849 | 369.000 | 19.300 | 38.60 | YES | YES | NA | YES |
| Beryllium | 1/19 | 5 | 0.284 | 0.895 | 0.250 | 0.50 | YES | NO | B2 | YES* |
| Cadmium | 4/19 | 21 | 1.976 | 24.800 | 0.258 | 0.52 | YES | YES | B1 | YES |
| Chromium | 19/19 | 100 | 12.800 | 65.100 | 7.423 | 14.85 | YES | NO | A** | YES* |
| Cobalt | 19/19 | 100 | 4.274 | 15.500 | 2.227 | 4.45 | YES | NO | NA | NO |
| Copper | 19/19 | 100 | 68.377 | 994.000 | 4.340 | 8.68 | YES | YES | D | YES |
| Vanadium | 19/19 | 100 | 13.199 | 52.500 | 9.977 | 19.95 | YES | NO | NA | NO |
| Zinc | 19/19 | 100 | 101.968 | 721.000 | 16.767 | 33.53 | YES | YES | D | YES |

Table 8.1 (continued)
STATISTICAL EVALUATION FOR THE SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOUND IN SURFACE SOIL SAMPLES
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Frequency of Detection | Percentage Detected (%) | Average Concentration (µg/g) | Maximum Detected Concentration | Background Average Concentration | 2x Background Average | Comparison to Background | Comparison to 2x Background | Carcinogenic Class | Evaluate in Risk Assessment? |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 19/19 | 100 | 1678.684 | 12,000.000 | 357.333 | 714.67 | YES | YES | NA | YES |
| Benzo[b]fluoranthene | 15/19 | 79 | 0.239 | 0.910 | 0.176 | 0.35 | YES | NO | B2 | YES* |
| Fluoranthene | 10/19 | 53 | 0.167 | 0.430 | 0.182 | 0.36 | NO | NO | D | NO |
| Benzo[k]fluoranthene | 1/19 | 5 | 0.021 | 0.100 | 0.017 | 0.03 | YES | NO | B2 | YES* |
| Acenaphthylene | 2/19 | 11 | 0.023 | 0.079 | 0.017 | 0.03 | YES | NO | D | NO |
| Chrysene | 3/19 | 16 | 0.153 | 0.490 | 0.110 | 0.22 | YES | NO | B2 | YES* |
| Anthracene | 5/19 | 26 | 0.026 | 0.069 | 0.017 | 0.03 | YES | NO | NA | NO |
| Pyrene | 14/19 | 74 | 0.133 | 0.360 | 0.138 | 0.28 | NO | NO | D | NO |
| Dibenzofuran | 2/19 | 11 | 0.019 | 0.049 | 0.017 | 0.03 | YES | NO | NA | NO |
| Benzo[a]pyrene | 14/19 | 74 | 0.134 | 0.390 | 0.101 | 0.20 | YES | NO | B2 | YES* |
| Dibenz[ah]anthracene | 1/19 | 5 | 0.021 | 0.095 | 0.017 | 0.03 | YES | NO | B2 | YES* |
| Benzo[a]anthracene | 11/19 | 58 | 0.095 | 0.340 | 0.068 | 0.14 | YES | NO | B2 | YES* |
| Benzoic acid | 2/19 | 11 | 0.611 | 3.600 | 0.365 | 0.73 | YES | NO | NA | NO |
| Di-n-butyl phthalate | 2/19 | 11 | 0.617 | 2.000 | 0.460 | 0.92 | YES | NO | NA | NO |
| Phenanthrene | 13/19 | 68 | 0.084 | 0.240 | 0.107 | 0.21 | NO | NO | D | NO |
| Naphthalene | 5/19 | 26 | 0.037 | 0.130 | 0.017 | 0.03 | YES | YES | D | YES |
| 2-Methylnaphthalene | 6/19 | 32 | 0.038 | 0.160 | 0.017 | 0.03 | YES | YES | NA | YES |
| Indeno[1,2,3-C,D]pyrene | 11/19 | 58 | 0.072 | 0.220 | 0.054 | 0.11 | YES | NO | B2 | YES* |
| Toluene | 6/19 | 32 | 0.002 | 0.014 | 0.001 | 0.00 | YES | YES | D | YES |

Table 8.1 (continued)

STATISTICAL EVALUATION FOR THE SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOUND IN SURFACE SOIL SAMPLES

Pedricktown Support Facility

Salem County, New Jersey

| Parameter | Frequency of Detection | Percentage Detected (%) | Average Concentration (µg/g) | Maximum Detected Concentration | Background Average Concentration | 2x Background Average | Comparison to Background | Comparison to 2x Background | Carcinogenic Class | Evaluate in Risk Assessment? |
|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 3/19 | 16 | 0.029 | 0.089 | 0.023 | 0.05 | YES | NO | D | NO |
| Methylene chloride | 5/19 | 26 | 0.039 | 0.180 | 0.020 | 0.04 | YES | NO | B2 | YES* |
| Trichloro-fluoromethane | 1/19 | 5 | 0.001 | 0.003 | 0.001 | 0.00 | YES | NO | NA | NO |

NOTE: YES - The arithmetic average of the soil samples are greater than the background; therefore, it will be considered a chemical of potential concern.
NO - The arithmetic average of the soil samples are less than the background; therefore, it will not be considered a chemical of potential concern.
* - Chemical is a Class A or B carcinogen; therefore, regardless of background concentration, will be evaluated in the risk assessment.
** - Classification is for Chromium VI only.

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## CHEMICALS OF POTENTIAL CONCERN FOR SURFACE SOIL SAMPLES
### Pedricktown Support Facility
### Salem County, New Jersey

| Parameter | Frequency of Detection | Percentage Detected (%) | Average Concentration ( g/g) | Maximum Detected Concentration | Background Average Concentration | 2x Background Average | Comparison to Background | Comparison to 2x Background | Carcinogenic Class | Evaluate in Risk Assessment? |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 19/19 | 100 | 29.719 | 220 | 25.770 | 51.54 | YES | NO | B2 | YES* |
| Arsenic | 19/19 | 100 | 9.881 | 35 | 2.323 | 4.65 | YES | YES | A | YES |
| Selenium | 13/19 | 68 | 0.877 | 5.400 | 0.101 | 0.20 | YES | YES | D | YES |
| Molybdenum | 6/19 | 32 | 1.043 | 3.370 | 0.500 | 1.00 | YES | YES | NA | YES |
| Potassium | 19/19 | 100 | 411.684 | 1,230 | 192.833 | 385.67 | YES | YES | NA | YES |
| Barium | 19/19 | 100 | 70.849 | 369 | 19.300 | 38.60 | YES | YES | NA | YES |
| Beryllium | 1/19 | 5 | 0.284 | 0.895 | 0.250 | 0.50 | YES | NO | B2 | YES* |
| Cadmium | 4/19 | 21 | 1.976 | 24.800 | 0.258 | 0.52 | YES | YES | B1 | YES |
| Chromium | 19/19 | 100 | 12.800 | 65.100 | 7.423 | 14.85 | YES | NO | A** | YES* |
| Copper | 19/19 | 100 | 68.377 | 994 | 4.340 | 8.68 | YES | YES | D | YES |
| Zinc | 19/19 | 100 | 101.968 | 721 | 16.767 | 33.53 | YES | YES | D | YES |
| Calcium | 19/19 | 100 | 1678.684 | 12,000 | 357.333 | 714.67 | YES | YES | NA | YES |
| Benzo[b]fluoranthene | 15/19 | 79 | 0.239 | 0.910 | 0.176 | 0.35 | YES | NO | B2 | YES* |
| Benzo[k]fluoranthene | 1/19 | 5 | 0.021 | 0.100 | 0.017 | 0.03 | YES | NO | B2 | YES* |
| Chrysene | 3/19 | 16 | 0.153 | 0.490 | 0.110 | 0.22 | YES | NO | B2 | YES* |
| Benzo[a]pyrene | 14/19 | 74 | 0.134 | 0.390 | 0.101 | 0.20 | YES | NO | B2 | YES* |
| Dibenz[ah]anthracene | 1/19 | 5 | 0.021 | 0.095 | 0.017 | 0.03 | YES | NO | B2 | YES* |
| Benzo[a]anthracene | 11/19 | 58 | 0.095 | 0.340 | 0.068 | 0.14 | YES | NO | B2 | YES* |
| Naphthalene | 5/19 | 26 | 0.037 | 0.130 | 0.017 | 0.03 | YES | YES | D | YES |
| 2-Methylnaphthalene | 6/19 | 32 | 0.038 | 0.160 | 0.017 | 0.03 | YES | YES | NA | YES |
| Indeno[1,2,3-C,D]pyrene | 11/19 | 58 | 0.072 | 0.220 | 0.054 | 0.11 | YES | NO | B2 | YES* |
| Toluene | 6/19 | 32 | 0.002 | 0.014 | 0.001 | 0.002 | YES | YES | D | YES |
| Methylene chloride | 5/19 | 26 | 0.039 | 0.180 | 0.020 | 0.04 | YES | NO | B2 | YES* |

NOTES: YES - The arithmetic average of the soil samples are greater than the background; therefore, it will be considered a chemical of potential concern.

NO - The arithmetic average of the soil samples are less than the background; therefore, it will not be considered a chemical of potential concern.

* - Chemical is a Class A or B carcinogen; therefore, regardless of background concentration, will be evaluated in the risk assessment.

** - Classification is for Chromium VI only.

Table 8.3
CHEMICAL INTAKES FROM INGESTION OF SURFACE SOILS
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Maximum Soil Concentration (mg/kg) | Ingestion Rate (mg soil/day) | Conversion Factor (unitless) | Exposure Frequency (days/yr) | Exposure Duration (yrs) | Body Weight (kg) | Non-carcinogenic Averaging Time (days) | Carcinogenic Averaging Time (days) | Non-carcinogenic SDI (mg/kg-day) | Carcinogenic SDI (mg/kg-day) | Noncarcinogenic Daily Intake (mg/day) | Carcino-genic Daily Intake (mg/day) | RDA* (mg/day) | Non-carcinogenic Intake vs RDA | Carcinogenic Intake vs RDA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 3.50E+01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 4.47E-04 | 3.84E-05 | 6.71E-03 | 5.75E-04 | NA | NA | NA |
| Barium | 3.69E+02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 4.72E-03 | 4.04E-04 | 7.08E-02 | 6.07E-03 | NA | NA | NA |
| Beryllium | 8.95E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.14E-05 | 9.81E-07 | 1.72E-04 | 1.47E-05 | NA | NA | NA |
| Cadmium | 2.48E+01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 3.17E-04 | 2.72E-05 | 4.76E-03 | 4.08E-04 | NA | NA | NA |
| Calcium | 1.20E+04 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.53E-01 | 1.32E-02 | 2.30E+00 | 1.97E-01 | 8E+02 | EL | EL |
| Chromium | 6.51E+01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 8.32E-04 | 7.13E-05 | 1.25E-02 | 1.07E-03 | 1.2E-01 | EL | EL |
| Copper | 9.94E+02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.27E-02 | 1.09E-03 | 1.91E-01 | 1.63E-02 | 1.5E-00 | EL | EL |
| Lead | 2.20E+02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 2.81E-03 | 2.41E-04 | 4.22E-02 | 3.62E-03 | NA | NA | NA |
| Molybdenum | 3.37E+00 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 4.31E-05 | 3.69E-06 | 6.46E-04 | 5.54E-05 | 7.5E-02 | EL | EL |
| Potassium | 1.23E+03 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.57E-02 | 1.35E-03 | 2.36E-01 | 2.02E-02 | 1.4E+03 | EL | EL |
| Selenium | 5.40E+00 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 6.90E-05 | 5.92E-06 | 1.04E-03 | 8.88E-05 | 2.0E-02 | EL | EL |
| Zinc | 7.21E+02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 9.22E-03 | 7.90E-04 | 1.38E-01 | 1.19E-02 | 1.0E+01 | EL | EL |
| 2-Methylnaphthalene | 1.60E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 2.05E-06 | 1.75E-07 | 3.07E-05 | 2.63E-06 | NA | NA | NA |
| Benzo[a]anthracene | 3.40E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 4.35E-06 | 3.73E-07 | 6.52E-05 | 5.59E-06 | NA | NA | NA |
| Benzo[a]pyrene | 3.90E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 4.99E-06 | 4.27E-07 | 7.48E-05 | 6.41E-06 | NA | NA | NA |
| Benzo[b]Fluoranthene | 9.10E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.16E-05 | 9.97E-07 | 1.75E-04 | 1.50E-05 | NA | NA | NA |
| Benzo[k]Fluoranthene | 1.00E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.28E-06 | 1.10E-07 | 1.92E-05 | 1.64E-06 | NA | NA | NA |
| Chrysene | 4.90E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 6.26E-06 | 5.37E-07 | 9.40E-05 | 8.05E-06 | NA | NA | NA |
| Dibenz[ah]anthracene | 9.50E-02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.21E-06 | 1.04E-07 | 1.82E-05 | 1.56E-06 | NA | NA | NA |
| Indeno[1,2,3-c,d]-pyrene | 2.20E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 2.81E-06 | 2.41E-07 | 4.22E-05 | 3.62E-06 | NA | NA | NA |
| Naphthalene | 1.30E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.66E-06 | 1.42E-07 | 2.49E-05 | 2.14E-06 | NA | NA | NA |

Table 8.3 (continued)
CHEMICAL INTAKES FROM INGESTION OF SURFACE SOILS
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Maximum Soil Concentration (mg/kg) | Ingestion Rate (mg soil/day) | Conversion Factor (unitless) | Exposure Frequency (days/yr) | Exposure Duration (yrs) | Body Weight (kg) | Non-carcinogenic Averaging Time (days) | Carcinogenic Averaging Time (days) | Non-carcinogenic SDI (mg/kg-day) | Carcinogenic SDI (mg/kg-day) | Noncarcinogenic Daily Intake (mg/day) | Carcino-genic Daily Intake (mg/day) | RDA* (mg/day) | Non-carcinogenic Intake vs RDA | Carcinogenic Intake vs RDA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methylene Chloride | 1.80E-01 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 2.30E-06 | 1.97E-07 | 3.45E-05 | 2.96E-06 | NA | NA | NA |
| Toluene | 1.40E-02 | 200 | 0.000001 | 350 | 6 | 15 | 2,190 | 25,550 | 1.79E-07 | 1.53E-08 | 2.68E-06 | 2.30E-07 | NA | NA | NA |

NOTES:
* - Recommended Dietary Allowances (RDA), National Academy of Sciences, Washington, D.C., 1989.
EL - Eliminate; compound was eliminated from evaluation because daily intake was less than the RDA.
NA - Not available/applicable

Table 8.4

SUMMARY TABLE OF REFERENCE DOSES AND CARCINOGENIC SLOPE FACTORS
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Reference Doses | | | | | | Carcinogenic Slope Factors | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oral RfD (mg/kg-day) | Oral Subchronic Rfd (mg/kg-day) | Chronic Uncert. Factor | Mod. Factor | Confidence | Target Organ | Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ | Unit Risk (µg/L) | Class |
| **VOLATILES** | | | | | | | | | |
| Methylene Chloride (75-09-2) | 0.06 a | 0.06 b | 100 | 1 | Medium | Liver | 0.0075 a | 0.00000021 a | B2 |
| Toluene (108-88-3) | 0.2 a | 2 b | 1,000 | 1 | Medium | Liver, kidneys, and CNS | NA | NA | D |
| **SEMIVOLATILES** | | | | | | | | | |
| 2-Methylnaphthalene | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo[a]anthracene (56-55-3) | NA | NA | NA | NA | NA | NA | 1.0585 c | NA | B2 |
| Benzo[a]pyrene(50-32-8) | NA | NA | NA | NA | NA | Forestomach | 7.3 a | 0.00021 a | B2 |
| Benzo[b]fluoranthene (205-99-2) | NA | NA | NA | NA | NA | NA | 1.022 c | NA | B2 |
| Benzo[k]fluoranthene (207-08-9) | NA | NA | NA | NA | NA | NA | 0.4818 c | NA | B2 |
| Chrysene (218-01-09) | NA | NA | NA | NA | NA | Liver and lungs | 0.03212 c | NA | B2 |
| Dibenz[a,h]anthracene | NA | NA | NA | NA | NA | NA | NA | NA | B2 |
| Indeno[1,2,3-c,d]pyrene (193-39-5) | NA | NA | NA | NA | NA | NA | 1.6936 c | NA | B2 |
| Naphthalene (91-20-3) | NA | NA | NA | NA | NA | Whole body | NA | NA | D |
| **METALS** | | | | | | | | | |
| Arsenic (7440-38-2) | 0.0003 a | 0.0003 b | 3 | 1 | Medium | Hyper-pigmentation | 1.79 f | 0.00005 f | A |
| Barium (7440-39-3) | 0.07 a | 0.07 b | 3 | 1 | Medium | Blood pressure | NA | NA | NA |
| Beryllium (7440-41-7) | 0.005 a | 0.005 b | 100 | 1 | Low | None observed | 4.3 a | 0.00012 a | B2 |

Table 8.4 (continued)

**SUMMARY TABLE OF REFERENCE DOSES AND CARCINOGENIC SLOPE FACTORS**
**Pedricktown Support Facility**
**Salem County, New Jersey**

| Parameter | Reference Doses | | | | | | Carcinogenic Slope Factors | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oral RfD (mg/kg-day) | Oral Subchronic Rfd (mg/kg-day) | Chronic Uncert. Factor | Mod. Factor | Confidence | Target Organ | Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ | Unit Risk (µg/L) | Class |
| Cadmium (7440-43-9) | 0.0005 a,c | NA | 10 | 1 | High | Significant proteinuria | NA | NA | B1 |
| Calcium (7440-70-2) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium(+3) (16065-83-1) | 1 a | 10 b | 100 | 10 | Low | No effects observed | NA | NA | NA |
| Chromium(+6) (18540-29-9) | 0.005 a | 0.02 b | 500 | 1 | Low | No effects observed | NA | NA | A |
| Copper (7440-58-8) | 1.3 mg/L b,d | 1.3 mg/L b,d | NA | NA | NA | Gastrointestine | NA | NA | D |
| Lead (7439-92-1) | NA | NA | NA | NA | NA | NA | NA | NA | B2 |
| Molybdenum (7439-98-7) | 0.005 a | 0.005 b | 30 | 1 | Medium | Increased uric acid | NA | NA | NA |
| Potassium | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium (7782-49-2) | 0.005 a | 0.005 b | 3 | 1 | High | Clinical selenosis | NA | NA | D |
| Zinc (7440-66-6) | 0.3 a | NA | 3 | 1 | Medium | Blood | NA | NA | D |

Notes:
a - IRIS.
b - HEAST, FY1993.
c - RfD for dietary exposure is 0.001 mg/kg-day.
d - Current drinking water standard; Drinking Water Criteria Document (EPA 1987) concluded that the data was inadequate for the calulation of an RfD for copper.
e - EPA Region III RBC (5/10/93).
f - IRIS, proposed.
NA - Not available.

Table 8.5
HAZARD INDICES FROM INGESTION OF SURFACE SOILS
(RESIDENTIAL CHILDREN)
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Residential Soil Ingestion SDI (mg/kg-day) | Subchronic Oral RfD (mg/kg-day) | Hazard Quotient (Intake/RfD) |
|---|---|---|---|
| Arsenic | 4.47E-04 | 3.00E-04 | 1.49E+00 |
| Barium | 4.72E-03 | 7.00E-02 | 6.74E-02 |
| Beryllium | 1.14E-05 | 5.00E-03 | 2.28E-03 |
| Cadmium | 3.17E-04 | NA | NA |
| Calcium | NA* | NA | NA |
| Chromium | NA* | 8.57 | NA |
| Copper | NA* | NA | NA |
| Lead | 2.81E-03 | NA | NA |
| Molybdenum | NA* | 5.00E-03 | NA |
| Potassium | NA* | NA | NA |
| Selenium | NA* | 5.00E-03 | NA |
| Zinc | NA* | NA | NA |
| 2-Methylnaphthalene | 2.05E-06 | NA | NA |
| Benzo[a]anthracene | 4.35E-06 | NA | NA |
| Benzo[a]pyrene | 4.99E-06 | NA | NA |
| Benzo[b]Fluoranthene | 1.16E-05 | NA | NA |
| Benzo[k]Fluoranthene | 1.28E-06 | NA | NA |
| Chrysene | 6.26E-06 | NA | NA |
| Dibenz[ah]anthracene | 1.21E-06 | NA | NA |
| Indeno[1,2,3-c,d]pyrene | 2.81E-06 | NA | NA |
| Naphthalene | 1.66E-06 | NA | NA |
| Methylene Chloride | 2.30E-06 | 6.00E-02 | 3.83E-05 |
| Toluene | 1.79E-07 | 2.00E+00 | 8.95E-08 |
| | | **INGESTION HAZARD INDEX =** | **1.56E+00** |

NA* = Not to be evaluated because daily intake of human nutrient is less than the RDA.
NA = Not available/applicable.

Table 8.6
CARCINOGENIC RISK ESTIMATES FOR INGESTION OF SURFACE SOIL
(RESIDENTIAL CHILDREN)
Pedricktown Support Facility
Salem County, New Jersey

| Parameter | Recreational Soil Ingestion CDI (mg/kg-day) | Oral SF 1/(mg/kg-day) | Chemical-specific Risk (Intake *SF) |
|---|---|---|---|
| Arsenic | 3.84E-05 | 1.79E+00 | 6.87E-05 |
| Barium | 4.04E-04 | NA | NA |
| Beryllium | 9.81E-07 | 4.30E+00 | 4.22E-06 |
| Cadmium | 2.72E-05 | NA | NA |
| Calcium | NA* | NA | NA |
| Chromium | NA* | NA | NA |
| Copper | NA* | NA | NA |
| Lead | 2.41E-04 | NA | NA |
| Molybdenum | NA* | NA | NA |
| Potassium | NA* | NA | NA |
| Selenium | NA* | NA | NA |
| Zinc | NA* | NA | NA |
| 2-Methylnaphthalene | 1.75E-07 | NA | NA |
| Benzo[a]anthracene | 3.73E-07 | 1.06E+00 | 3.95E-07 |
| Benzo[a]pyrene | 4.27E-07 | 7.30E+00 | 3.12E-06 |
| Benzo[b]Fluoranthene | 9.97E-07 | 1.02E+00 | 1.02E-06 |
| Benzo[k]Fluoranthene | 1.10E-07 | 4.82E-01 | 5.30E-08 |
| Chrysene | 5.37E-07 | 3.21E-02 | 1.72E-08 |
| Dibenz[ah]anthracene | 1.04E-07 | NA | NA |
| Indeno[1,2,3-c,d]pyrene | 2.41E-07 | 1.69E+00 | 4.07E-07 |
| Naphthalene | 1.42E-07 | NA | NA |
| Methylene Chloride | 1.97E-07 | 7.50E-03 | 1.48E-09 |
| Toluene | 1.53E-08 | NA | NA |
| | **INGESTION CARCINOGENIC RISK =** | | **7.79E-05** |

NA* = Not to be evaluated because daily intake of human nutrient is less than the RDA.
NA = Not available/applicable.

Table 8.7
SUMMARY OF HRS SCORE
Pedricktown Support Facility
Salem County, New Jersey

| PATHWAY | LIKELIHOOD OF RELEASE | WASTE CHARACTERISTICS | TARGETS | PATHWAY SCORE |
|---|---|---|---|---|
| GROUNDWATER | 550 | 18 | 1.35E+02 | 16.20 |
| Drinking Water | 320 | 32 | 0.00E+00 | 0.00 |
| Food Chain | 320 | 320 | 3.10E-04 | 0.00 |
| Environmental | 320 | 320 | 8.00E+00 | 9.93 |
| SURFACE WATER | -- | -- | -- | 9.93 |
| Resident | 550 | 18 | 5.00E+00 | 0.60 |
| Nearby | 5 | 18 | 1.77E+00 | 0.00 |
| SOIL EXPOSURE | -- | -- | -- | 0.60 |
| AIR | 300 | 18 | 4.80E+01 | 3.41 |
| PSF SITE SCORE = 9.63 | | | | |

# 9.0 QUALITY ASSURANCE AND QUALITY CONTROL

The purpose of the quality assurance program at the PSF site was to maintain an established level of precision, completeness, accuracy, and conformance with EPA and USAEC standards. The ESI was conducted within the guidelines established in the Quality Assurance Project Plan (QAPP) prepared for the PSF ESI and approved by USAEC. Guidelines in the QAPP were based upon standards outlined in the *USATHAMA QA Program* (January 1990).

## 9.1 Field Operations

All field work at the PSF site was performed in accordance with the Standard Operating Procedures (SOPs) described in the PSF Project Plan and QAPP, including procedures for sampling, sample custody, documentation, document control, decontamination, field analysis, and instrument calibration.

Field quality control samples were collected during the investigation and submitted to the ESE laboratories in Gainesville, Florida, and Denver, Colorado, for analysis. The samples consisted of field blanks, trip blanks, temperature control samples, and rinsates. Data validation for this project was provided by ESE and USAEC personnel in accordance with the PSF QAPP, EPA data validation guidelines, and industry practice.

Water samples from a bottled, deionized water source, used for blanks and a final rinse during decontamination, and the on-site water supply, used for steam cleaning and initial decontamination, were analyzed for TCL and TAL parameters, explosives, and TPHC by ESE. Low levels of TPHC, calcium and bis(2-ethylhexyl)phthalate were detected in the bottled water source. Levels of magnesium, sodium, calcium, barium, potassium and chloromethane were detected in the on-site water source. Utilization of these water sources was approved by the USAEC chemist prior to initiation of field activities.

A team from USAEC audited the field activities at PSF on July 1, 1993. At this time, groundwater monitoring wells were being purged and sampled. USAEC representatives included the Safety Engineer and Chemist from their Environmental Services Division, and an Environmental Scientist from their Research and Development Division. The results of the audit were transmitted to the USAEC Project Manager, who in turn provided this information verbally to the ESI Contractor. All concerns regarding health and safety and sampling protocol were subsequently addressed by the field team leader and field personnel.

## 9.2 Installation Restoration Data Management Information System

The Installation Restoration Data Management Information System (IRDMIS) consists of a distributed network of IBM microcomputers, or their functional equivalent, that provides for the entry, verification, and output of chemical, geotechnical, and map data, in support of the USAEC Installation Restoration Program. IRDMIS allows for record entry, error and duplicate error checking, and quality control for chemical, geotechnical, and map data collected at PSF. Potomac Research, Inc. (PRI) is contracted by USAEC to manage IRDMIS. PRI kept daily records of files received and their acceptance status and reported to USAEC on a weekly basis. Files failing the final error check were required to be corrected and resubmitted. The error checking procedures are described as a data pyramid, broken into 3 levels of data qualification and acceptance. Only when the data has passed the 3rd level, can it be accepted as validated and utilized for site analysis and interpretation.

## 9.3 Laboratory Analytical Operations

To control the quality of the analytical data, only USAEC approved procedures and equipment were used for sample preparation and analysis. SOPs for analytical methods utilized for samples collected at the PSF site are presented in the ESI Project Plan QAPP. ESE is a USAEC-certified laboratory for the methods employed on the PSF samples. These methods include: 00, HG9, JD28, JS13, LM27, LM28, LM31, 99, LF03, and LW12 for soils; and 00, SD30, SS14, UM27, WW8, UM28, 99, UF03, and UW19 for water. Precision, accuracy, representativeness, comparability, and completeness of the analytical process were assessed through the use of calibration checks, method blanks, replicate analyses, and other Quality Control (QC) methods as required by the specific laboratory analytical methods. Laboratory QC data were provided with the data packages to USAEC for evaluation and are included in this report as Appendix K. Under the Contract Laboratory Class program, the USAEC Chemistry Branch evaluates the performance of all their certified laboratories in analyzing for commonly encountered analytes at project sites. USAEC's certification program, as well as their continued project-specific evaluation process, further assures that data quality objectives are met.

## 9.4 Documents and Deliverables

The following QC documents and deliverables must be submitted to USAEC in support of the project work performed at PSF:

a. Audit reports
b. Monthly status reports of QC activities
c. QC charts (submitted weekly during period of chemical analyses)
d. Logbooks
e. IRDMIS submissions
f. Final QA report
g. Lot Specific Data Folders

Deliverable documents for the PSF ESI, including this ESI Report, were subjected to a Quality Assurance (QA) review prior to submittal to USAEC. The QA review process included critical evaluations by the Versar QA officer and Project Manager, as well as technical specialists. The documents are then submitted for internal review by USAEC project personnel.

## 10.0 EXPANDED SITE INSPECTION CONCLUSIONS

The conclusions drawn from the ESI study are discussed under five separate categories: site hydrogeology, the re-evaluation of AOCs and SWMUs at PSF, a summary of multi-media sampling and analysis, HRS scoring results, and the findings associated with the preliminary risk assessment.

### 10.1 Site Hydrogeology

The aquifer underlying PSF is the Pleistocene Cape May formation. This unconfined aquifer is approximately 30 feet in thickness, with a hydraulic conductivity ranging from 10-30 feet per day, and a hydraulic gradient of 0.003. Groundwater flow at PSF occurs in a northwesterly direction at rate ranging from 0.18 to 0.71 feet per day. A small volume of groundwater exfiltrates to the drainage swale at the northern PSF property boundary. However, most particles in the aquifer track towards the nearby Delaware River and discharge from the aquifer at that location. Tidal effects on groundwater flow at the PSF site proper are negligible but appear to influence flowpaths as particles track closer to the river. Groundwater modeling, using the two-dimensional finite difference grid FLOWPATH code, generally supports these interpretations.

In the early 1980s, construction by the ACOE of a below grade, bentonite cut-off wall downgradient of the site appears to have had a significant impact on both groundwater elevations and flowpaths in the immediate vicinity of PSF. Present water table elevation data at PSF suggest that many of the site's existing underground storage tanks are now submerged. Although no releases from any of these USTs have been documented to date, the position of these tanks with respect to the water table surface may increase the necessary level of investigative effort during future tank closure operations.

### 10.2 Evaluation of AOCs and SWMUs Identified in the PA and ESI Project Plan

The PA conducted at PSF indicated various AOCs and SWMUs initially thought to be potential sources of contamination at the site. A more definitive perspective on the degree to which each of these areas may or may not have impacted site media has now been developed from ESI data and is discussed in the following paragraphs.

#### 10.2.1 Underground Storage Tanks

Of the 57 tanks at PSF, a total of 53 USTs (including the 6 tank anomalies located through GPR) are known to exist. These were installed from approximately

1931 to 1964. The ESI did not provide a tank by tank assessment but did evaluate those areas at PSF where the highest density of large USTs are located. These areas, in the central portion of PSF, were previously interpreted to be the cause of numerous soil gas anomalies originating near Buildings 404, 413, 422, and 432 and extending downgradient in a northwesterly direction. Five monitoring wells installed in this potential transport "corridor" did not reveal the presence of any significant petroleum hydrocarbon plumes. The recommended disposition of all USTs at PSF is discussed in Section 11.0 of this report.

#### 10.2.2 Transformers

A thorough inspection of site transformers at PSF revealed only 3 suspected areas that warrant future soil sampling and analysis for PCBs. Inspection of all site transformers was conducted to check for stained soils or stressed vegetation. No staining was found, however 3 transformer areas showed possible evidence of stressed vegetation (Appendix A, Photographs 25-27). There was no evidence at any of the other transformer locations to suspect leakage.

#### 10.2.3 Stormwater Catch Basins

The PSF PA Report also indicated the site stormwater catch basins as potential AOCs. The objective for assessment of sediment and surface water media at these locations was to determine if any contaminants present in the storm drains are impacting surface water bodies. ESI sampling did show SVOC, BTEX, and inorganic contaminants to be present at certain catch basin locations, but no direct correlation was made to surface water quality of the drainage swale receiving these stormwater discharges. This conclusion is based on the following data limitations:

- It was not possible to establish background water quality conditions for the drainage swale.
- Groundwater, as well as surface water, discharges to the drainage swale.
- Run-off from the Pedricktown South Dredged Materials Storage Area also enters the drainage swale and effects its water quality.
- Surface water sampling did not follow any significant rainfall having been scheduled during the summer months at PSF.

#### 10.2.4 Waste and Material Storage Areas

In addition to the assessment of areas indicated by historic aerial photos to be possible waste or materials staging areas, four specific waste/materials storage areas were assessed at PSF. These include the waste oil tank near Building 413, the

former drum storage area on the northeast side of the motor pool building, the former coal bins, and the scrap metal storage area located at the far northern end of PSF.

Monitoring well MW16-001 detected low levels of PCE just downgradient of the 1000-gallon waste oil tank at the rear of Building 413. This contaminant may be associated with a possible release from that tank. However, all other PSF monitoring wells installed to evaluate similar soil gas anomalies (several of which are located downgradient of both this tank and MW16-001) failed to detect the presence of any chlorinated solvents. Therefore, no significant groundwater contamination is believed to exist in conjunction with this UST, or to be associated with any of the soil gas anomalies identified during the PA.

The possibility of soil contamination related to former drum storage at the northeast corner of Building 404 (the motor pool area) was evaluated with soil boring SB16-001. Drum storage at this location was previously limited to several drums stored on wooden pallets underlain by asphalt paving. No impacts to site soils were observed in this boring installed at the former pallet locations.

A soil boring was also installed adjacent to the former coal bins, which are currently used to store miscellaneous scrap lumber, metal, and old building furnishings. SB10-001 was sited on the northwest side of these concrete bins to assess possible impacts from the previous storage of coal and other materials at this location. From inspection of historic aerial photos, the contents of these bins occasionally exceeded the physical limits of the structure. No soil impacts were found to exist at the location of SB10-001.

The former scrap metal storage area located at the northernmost limit of the PSF site was evaluated with two soil borings and two groundwater monitoring wells. This area had been observed to contain scattered shell casings and shrapnel. The former storage area is generally flat and, for the most part, grass-covered. Based on field inspection of this area and soil boring data, material formerly stored here appears to be limited to that which was previously described. Laboratory soil analyses revealed no parameters exceeding three times site background values and no site-related impacts. Although the groundwater from MW11-001 contained a concentration of 7.4 ppb PCE, this parameter is not affiliated with any suspected contaminant source or former materials storage at this location.

### 10.2.5 Former Paint Shop and Ordnance Disassembly Buildings

No soil or groundwater impacts were discovered in soil borings and/or monitoring wells sited to evaluate the former paint shop or ordnance disassembly buildings. The analyses of all soil and water samples in the northern sections of PSF where ordnance disassembly activities are believed to have occurred did not reveal the presence of any explosive compounds. These facilities are presently used as maintenance and storage areas, respectively.

### 10.2.6 Current Sewage Treatment Plant Area

The current sewage treatment area, located at the far northwestern corner of PSF, has a number of former and current AOCs. This area was reportedly the location of former septic tank leaching ponds and an incinerator. There are presently two USTs in this area, and the 1991 Petrex soil gas survey indicated at least two distinct soil gas anomalies here. This portion of the PSF site was evaluated via the installation of five soil borings which were converted to groundwater monitoring wells. No volatile organic contaminants were detected during soil or groundwater sampling. However, heavy metal concentrations above two times background values were detected over an area of approximately 3.7 acres in the northwest corner, adjacent to the site property boundary. Since the exact locations and historical operations of the former leaching ponds and incinerator are unknown, a definite correlation of the metal-impacted soils to these former wastewater and burn areas cannot be firmly established.

## 10.3 Summary of Multi-Media Sampling and Analysis

A brief synopsis of the results of surface soil, subsurface soil, sediment, surface water, and groundwater analytical results is presented in this report section to provide a broad overview of site conditions at PSF. Detailed data comparisons are presented in report Sections 3.4, 4.1, 4.2 and 5.2.

### 10.3.1 Surface Soil Quality Conditions

For purposes of HRS scoring, surface soil concentrations were compared to 3 times background levels. Those parameters exceeding this threshold value were then considered to be site-related and were factored in with other criteria to evaluate PSF as a potential NPL candidate. A conservative approach for data comparison was taken for risk assessment objectives, where future residential land use scenarios are considered a possibility for the site. In the latter case, soil concentrations were

evaluated against 2 times background conditions as well as proposed NJDEPE cleanup standards.

The only compound detected in surface soil samples that was not detected in excess of two times background in at least one sample was thallium. However, the only compounds that exceeded NJDEPE direct contact cleanup criteria were arsenic, cadmium, and benzo[b]fluoranthene. For most of these compounds, there was no distributional pattern (e.g., impacts appeared to be randomly distributed about the site). Elevated arsenic concentrations were found in SB11-001 and SB11-003, which located north and southeast of Building 495, in the area of previous ordnance disassembly activities. A review of surface soil data points exceeding cleanup criteria indicates that SB11-001 consistently exceeded cleanup standards for inorganic compounds. This boring was installed in the northwestern corner of PSF, near the former scrap metal storage area. The occurrence of arsenic in surface soils at this location does not correlate with the sporadic presence of shell casings and shrapnel observed in this area. Arsenic is utilized as a rat poison, weed killer, wood preservative, and fixative. No documentation exists as to whether this compound was used for any of these purposes throughout the history of the installation.

### 10.3.2 Subsurface Soil Quality Conditions

The PSF ESI Project Plan initially anticipated a much deeper water table at the site than was actually observed during fieldwork. This factor appears to be attributable to the presence of a downgradient cut-off wall constructed by the ACOE on their Penns Grove facility (see Section 10.1). Due to the shallow occurrence of groundwater, averaging 2-6 feet bgs, at the PSF site, the strategy of acquiring incremental subsurface samples (for vertical soil quality profiling to the soil/water interface) did not produce as large a quantity of samples for comparison as anticipated. Nonetheless, those samples which were collected and analyzed were evaluated using the same criteria as for surface soils.

A number of metals and PAHs were found to exceed two times background conditions at PSF, however none of these exceeded NJDEPE cleanup criteria. Detectable levels of arsenic were found in several of the subsurface soil samples collected from the wells and borings located near in the former leaching ponds and downgradient of the former scrap metal storage area. None of these arsenic concentrations in the subsurface soil exceeded NJDEPE non-residential direct contact standards.

### 10.3.3 Sediment Quality Conditions

The quality of stormwater catch basin samples varied significantly across the PSF site. Where observed, most impacts appear to be petroleum hydrocarbon-related. Samples SD10-001 and SD16-001 contained levels of PAHs, TPH and BTEX compounds, respectively. The latter location receives drainage from the facility motor pool (Building 404); therefore, the BTEX concentrations in that sample are probably gasoline derivatives. Elevated levels of arsenic in the drainage swale samples may be related to the detectable occurrence of this compound in contiguous surface and subsurface soil samples at the northwestern portion of the site.

### 10.3.4 Surface Water Quality Conditions

No definitive contaminant distribution patterns were noted in PSF surface water samples. Samples were collected both from on-site stormwater catch basins and from the drainage swale where stormwater from the basins is discharged. Because of the locations of the stormwater discharge points with respect to the swale, no representative background sample was acquired. Other factors affecting surface water data comparisons include the contribution of water from the uppermost aquifer to the swale, overland run-off from the nearby dredged materials entering the swale, and the acquisition of surface water samples during mid-summer, a period of relative drought.

The most downgradient surface water sample collected, SW13-001, was not significantly impacted. However, PCE was noted at this sample location, suggesting that stormwater discharges to the drainage swale may have some effect on the quality of this surface water body. The volume of flow in the swale itself is minuscule in comparison with its ultimate discharge point at the Delaware River, approximately 0.75 miles to the north-northwest. No impact to surface water quality in the Delaware River is believed to occur due to the large volume differential.

### 10.3.5 Groundwater Quality Conditions

The shallow occurrence of groundwater at PSF provides an abbreviated transport pathway for any near-surface releases which may occur at the site. It is also notable that aquifer recharge following a major rainfall event probably has an immediate dilutional effect on any impacted areas, especially at water table depths. The shallow occurrence of groundwater at PSF can be traced back to the construction of a downgradient cut-off wall by the ACOE in the early 1980s. Prior to that time, piezometric data (1958-59 geotechnical borings) suggest that groundwater may have been as much as 10 feet deeper than is presently observed. Monitoring wells

installed during the ESI were screened at water table depths primarily based on the assumption that impacts to groundwater would likely be petroleum hydrocarbon-related. Therefore, water quality in the middle and lower segments of the Cape May aquifer was not evaluated.

Groundwater samples were collected for analysis from 19 on-site, and 3 off-site, monitoring wells. Analytical data comparisons show that the only compounds detected in excess of two times background that also exceeded the NJDEPE cleanup standards, were lead, arsenic, antimony, cadmium, chromium and PCE. However, background concentrations also exceeded the NJDEPE criteria for each of these compounds (except for chromium), suggesting that they may not be site-related.

Areas where groundwater quality may be influenced by surface and subsurface soil impacts include the northwestern portion of the site, in the vicinity of the former scrap metal storage area, and the current sewage treatment plant area. The occurrence of certain metals in groundwater at this location may correlate with the presence of the same compounds in surface and subsurface soil samples. PCE was detected at low levels just downgradient of a waste oil tank located at the rear of Building 413, near the central portion of PSF. Although the occurrence of this compound may be attributable to a release in the tank vicinity, MW16-001 shows a relatively limited impact to groundwater quality at a distance of only 50 feet downgradient of the tank site.

### 10.4 HRS Scoring

Data obtained from the ESI at the PSF facility were used to support completion of HRS scoring of the site. The EPA's PREscore program was used to perform the HRS scoring and determine the potential National Priority List candidacy of the PSF site. Completion of the HRS resulted in a site score of 9.63, well below the 28.5 required for NPL consideration. Primary factors contributing to the score were low waste characteristics values calculated for the site and the limited targets located in the area of the site. Two sources were identified as a result of site sampling: a 1,000-gallon underground waste oil storage tank and approximately 3.7 acres of impacted soil at the northwest corner of the property. The Groundwater Migration Pathway achieved the highest pathway score (16.2) due primarily to a suspected release of PCE from the waste oil tank near Building 413. No drinking water wells are effected by this release.

## 10.5 Preliminary Risk Assessment

A preliminary risk assessment was conducted to evaluate human health risks posed by the chemicals found at PSF. It was intended to provide the most conservative estimate of future potential human health risks by considering exposure of the most sensitive population (children) to the most contaminated site medium (soil) via the most conservative route of migration (ingestion). Presently, those portions of PSF where the most contaminated media were found to occur are not available for residential land use scenarios and have highly restricted access. Therefore, the assumed residential land use conditions which form the basis for risk assessment calculations depend entirely on future site usage activities.

An evaluation of non-carcinogenic hazards and carcinogenic risks calculated for incidental ingestion of surface soils by future residential children concluded the following:

- Arsenic is the only compound for which a chemical-specific hazard quotient of greater than one (1.49) was calculated. Arsenic also contributes 95.5 percent of the total hazard from site soils. Therefore, the surface soils at PSF may pose adverse health effects to future residential children.

- The total carcinogenic risk from surface soils on residential children is within EPA's target range of 1E-6 to 1E-4, with a risk of 7.79E-5, but is above NJDEPE's recommended risk level of 1E-6.

## 11.0 RECOMMENDATIONS

1) A site-wide Tank Upgrade and Closure Plan should be developed and implemented. The goal of this Plan should be the removal and closure of all tanks that are no longer required by PSF to be in service, as well as upgrading/replacing all tanks which are still necessary for base operations. The rationale for the recommendations is based on the ages of the tanks (currently 25 to 62 years old); the materials of construction (steel, without leak detection devices); and the fact that the tanks are wholly or partially submerged in the groundwater. The elements of the Plan should include:

a. A determination by PSF personnel of the existing tanks they require in service.
b. Precision (leak) testing of the required tanks to ensure integrity.
c. An outline of the regulatory requirements to upgrade those tanks which are required and which pass the precision testing.
d. A definition of any new tanks/storage capacity required for base operations.
e. Field confirmation of the 6 suspected UST locations identified by the GPR survey (as well as the 3 abandoned USTs reported in the PA, and listed as AA, BB and CC on Figure 7.1 herein).
f. Design and planning for the removal and closure of any USTs which failed precision testing, as well as the remaining, out-of-service and unnecessary tanks at PSF.

2) Removal and disposal of the sediment in the site catch basins should proceed. It is recommended that the surface water in the north drainage swale be resampled both prior to and after this sediment removal to evaluate the effects of this action. Samples should be collected after a heavy rain. Sampling locations should include: SW2-001, SW13-001 as well as approximately 3-4 locations in between these surface water gauges. Within the ESI Project Plan, it was decided that no adequate background sample for the sediment or surface water within the swale could be collected. Samples could be collected from the Penns Grove Project lake gauging station, for both surface water and sediment local background purposes, and to complete the evaluation of the removal action discussed previously.

3) From inspection of the site transformers at PSF, it is recommended surface soil samples should be collected from 3 separate areas, and analyzed for PCBs. These areas include the soil under transformers located along Route 130, east of Building 322, and northwest of Building 371. Should PCBs be detected within the soil in these

vicinities, the transformers should be thoroughly inspected and wipe samples taken from the surface of each suspected of leaking. If PCBs are detected in the wipe samples as well as in the corresponding soil, the transformer(s) should be replaced, and the contaminated soil remediated.

4) During implementation of the UST upgrade and removal program, it is recommended that 12 selected wells on-site be resampled once, to confirm water quality data in the vicinity of USTs proximal to these monitoring locations. Wells that will function for this limited monitoring purposes should include: MW2-001, MW8-001, MW10-001, MW11-002, MW12-001, MW12-002, MW16-001, MW16-002, MW20-001, MW21-001, MW22-001, and MW24-001. The remaining wells should eventually be scheduled for abandonment in accordance with NJDEPE guidelines. Unattended wells are subject to vandalism and can serve as potential sources of aquifer contamination should they be mistaken for fill pipes, etc.

5) The Site File for PSF was compiled as required when conducting an ESI. It is and will be an important reference for those involved with the site in the future. The Site File includes resources such as investigations previous to the ESI, sampling and analysis data, ESI Project Plan, correspondences with regulatory agencies, community relations correspondence, maps, photographs and illustrations, specific computer model programs, pertinent legal documents and a list of contractors. The accessibility of such geotechnical and chemical data may obviate the need for repetition of site investigation activities.

The Site File should be carefully archived for all future environmental and engineering activities that may take place at PSF, specifically in the UST upgrading and removal process as well as during the sediment removal and surface water sampling activities recommended herein.

## 12.0 REFERENCES

### Personal Contacts

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**Aerial Photographs**

Aerial Photograph of PSF Study Site, North and South Disposal Areas (1" = 200'). Kucera International, Inc., 38133 Western Parkway, Willoughby, Ohio (216-975-4230).

## Maps

U.S. Geological Survey. 7.5 Minute Topographic Quadrangles:

1. Bridgeport, NJ-PA, revised 1986
2. Marcus Hook, PA-NJ-DE, revised 1986
3. Penn's Grove, NJ-DE, revised 1986
4. Wilmington North, DE-PA, revised 1987
5. Wilmington South, DE-NJ, revised 1987
6. Woodstown, NJ, 1967
7. Salem , NJ, revised 1986
8. Delaware City, DE-NJ, 1970

U.S. Army Corps of Engineers
Various maps of Pedricktown North and South Dredged Materials Storage Areas and the Penn's Grove Project man-made lake.

| APPENDICES | |
|---|---|
| *A* | *Photographs* |
| *B* | *Borehole Lithologic Logs* |
| *C* | *Groundwater Modeling Data* |
| *D* | *Aquifer Testing Documentation* |
| *E* | *Original Laboratory Analytical Data* |
| *F* | *Chain-of-Custody Documentation* |
| *G* | *Geotechnical Testing Report* |
| *H* | *Well Development Field Documentation* |
| *I* | *GPR Documentation* |
| *J* | *HRS Scoring Data* |
| *K* | *Quality Control Analytical Data* |

# PHOTOGRAPHS

## SITE PHOTOGRAPHIC LOG

Pedricktown Support Facility
Salem County, New Jersey

| Photograph Number | View Direction | Description |
|---|---|---|
| 1 | South-southeast | Marshy area near P4-001, looking toward Salem County Community College on the left with the PSF site on the right. |
| 2 | East | Penns Grove Project Lake. |
| 3 | North | Drilling P9-001. |
| 4 | Northeast | Drilling MW12-002. |
| 5 | East | Installing MW12-002. |
| 6 | West | Making concrete form for MW11-001. |
| 7 | East | MW11-002, completed. |
| 8 | Northwest | Investigation derived waste drum storage area. |
| 9 | West | Logging core sample. |
| 10 | Northwest | Ground water sampling at EHW-13. |
| 11 | Northwest | Developing P15-001. |
| 12 | Southwest | Purging MW16-001. |
| 13 | Northwest | Slug testing at MW8-001. |
| 14 | Southeast | GPR Area 3, north of Building 380. |
| 15 | North | Installing staff gauge at SW2-001. |
| 16 | Northwest | SW13-001 location. |
| 17 | Northwest | SW17-001 storm drain. |
| 18 | Southeast | SW16-001 storm drain near motor pool. |
| 19 | Northeast | Abandoned potable water USTs northwest of Building 432, with Building 452 in background. |
| 20 | Northeast | Sewer manhole and fuel oil UST near occupied residential area on-site. |
| 21 | Northeast | Waste oil UST northwest of Building 413, with Building 422 in background. |
| 22 | Northwest | Gasoline UST associated with the motor pool, southeast of Building 432. |
| 23 | Southeast | Gasoline pump with paint shop (Building 184) in background. |
| 24 | Northwest | Diesel UST associated with the motor pool, located along Railroad Avenue. |
| 25 | South | Modified pole-mounted transformers along Route 130. |
| 26 | Northeast | Modified pole-mounted transformers east of Building 322. |
| 27 | East | Pole-mounted transformers northwest of Building 371. |
| 28 | South | Pole-mounted transformers along Central Road. |
| 29 | Southeast | Modified pole-mounted transformers near Building 173. |

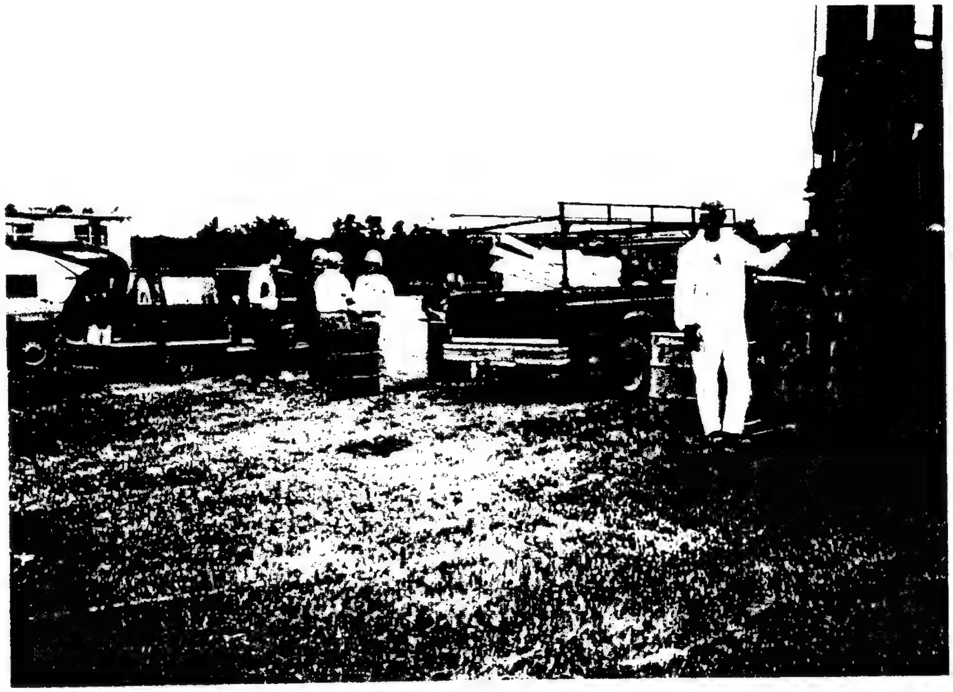
SITE PHOTOGRAPHIC LOG (continued)

Pedricktown Support Facility
Salem County, New Jersey

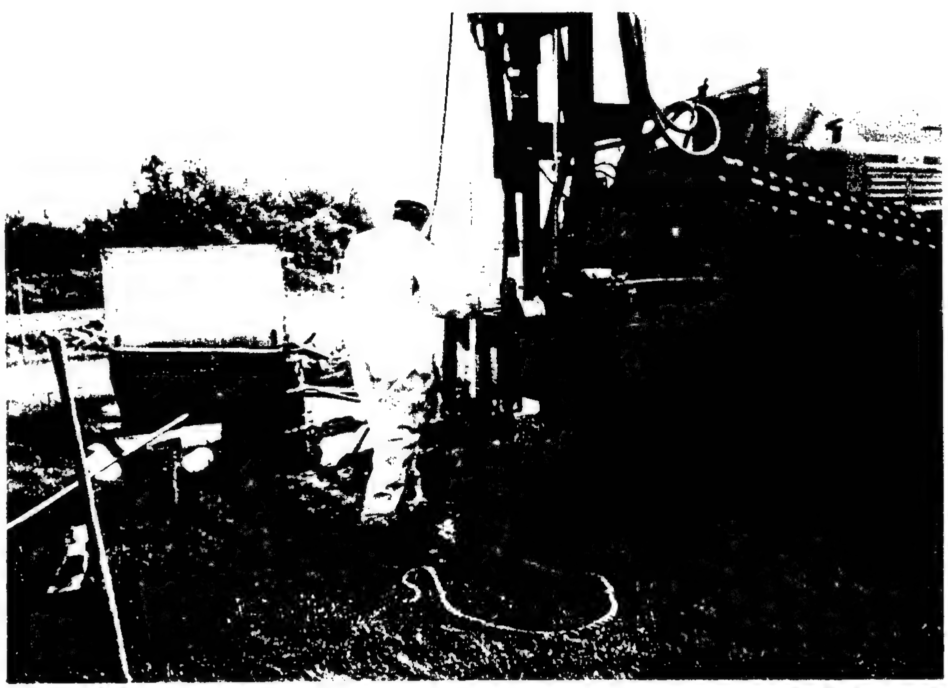
| Photograph Number | View Direction | Description |
|---|---|---|
| 30 | Southeast | Ground-mounted transformers southwest of Building 495. |
| 31 | West | Modified pole-mounted transformer west of Building 229. |
| 32 | North | Pole-mounted transformers north of Building 273. |
| 33 | Northeast | Pole-mounted transformers south of Building 351. |
| 34 | Northwest | Pole-mounted transformers northwest of Building 380. |
| 35 | Northeast | Pole-mounted transformers southwest of Building 464. |
| 36 | Southeast | Pole-mounted transformers southeast of Building 269. |
| 37 | East | Pole-mounted transformer north of Building 184. |
| 38 | Southeast | Pole-mounted transformer southwest of Building 474. |
| 39 | Southeast | Pole-mounted transformer southwest of Building 434. |
| 40 | North | Pole-mounted transformer west of Building 380. |
| 41 | East | Pole-mounted transformer northwest of Building 197. |
| 42 | North | Pole-mounted transformer north of Building 273. |
| 43 | South | Pole-mounted transformer northwest of Building 286. |
| 44 | West | Pole-mounted transformer west of Building 273. |
| 45 | East | Pole-mounted transformer southwest of Building 120. |
| 46 | Southeast | Pole-mounted transformer northwest of Building 190. |

PHOTOGRAPH 1

PHOTOGRAPH 2



**PHOTOGRAPH 3**



**PHOTOGRAPH 4**

PHOTOGRAPH 5

PHOTOGRAPH 6

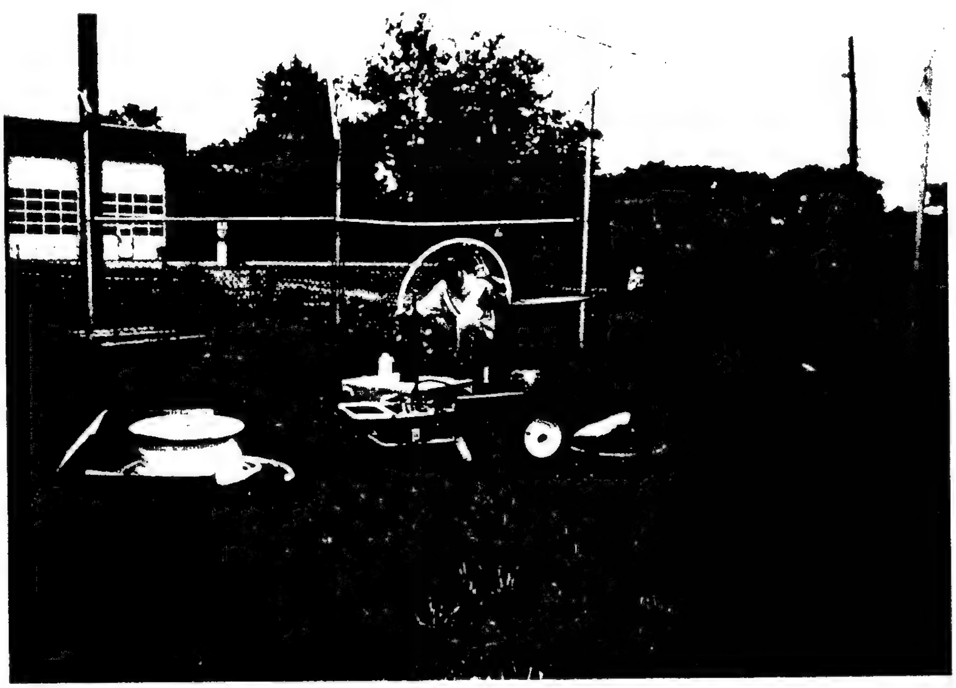
PHOTOGRAPH 7

PHOTOGRAPH 8

PHOTOGRAPH 9

PHOTOGRAPH 10

PHOTOGRAPH 11



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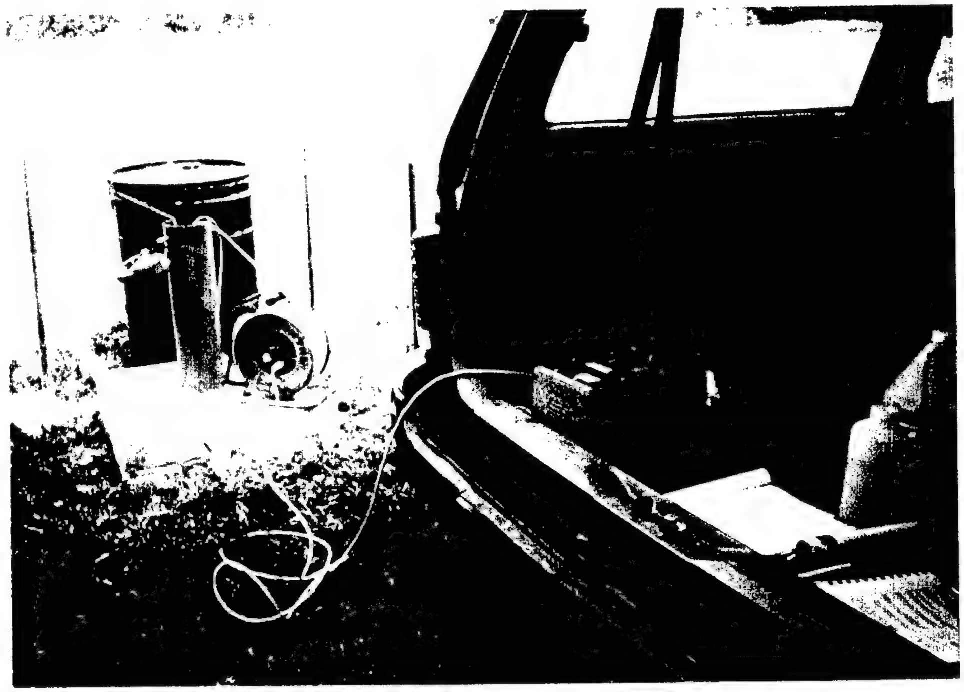
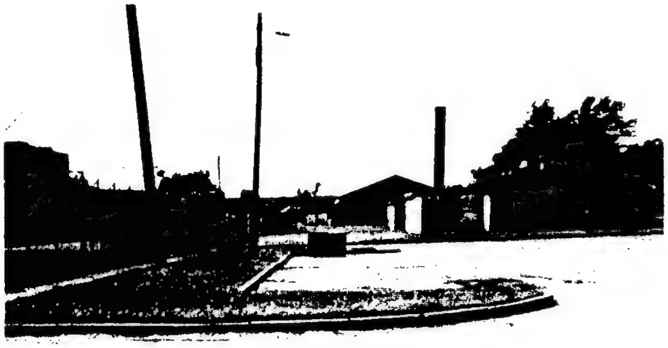


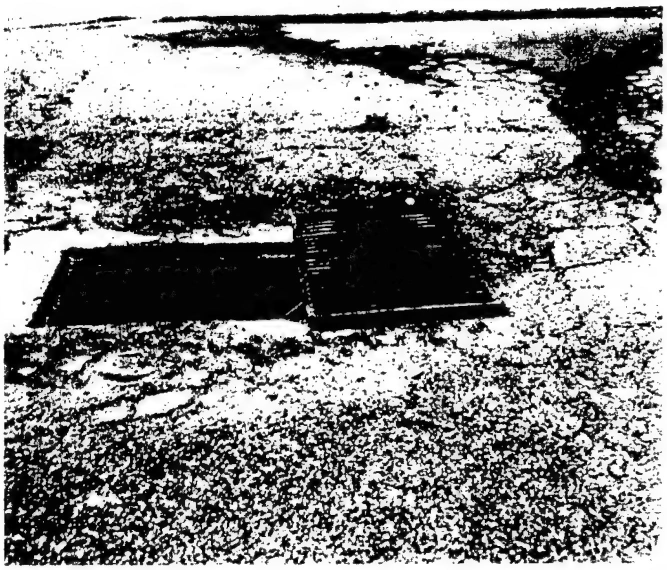
PHOTOGRAPH 13

PHOTOGRAPH 14

PHOTOGRAPH 15

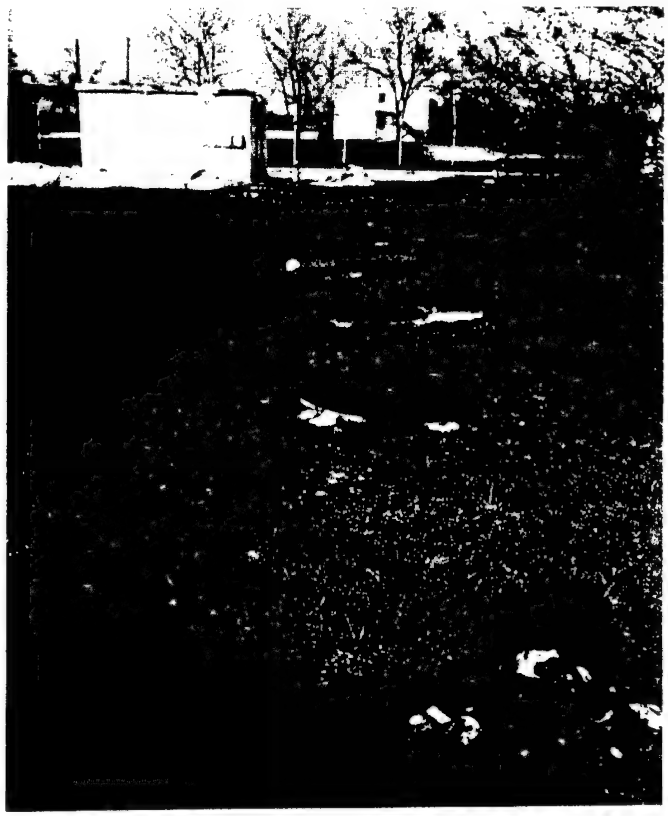
PHOTOGRAPH 16





PHOTOGRAPH 17

PHOTOGRAPH 18

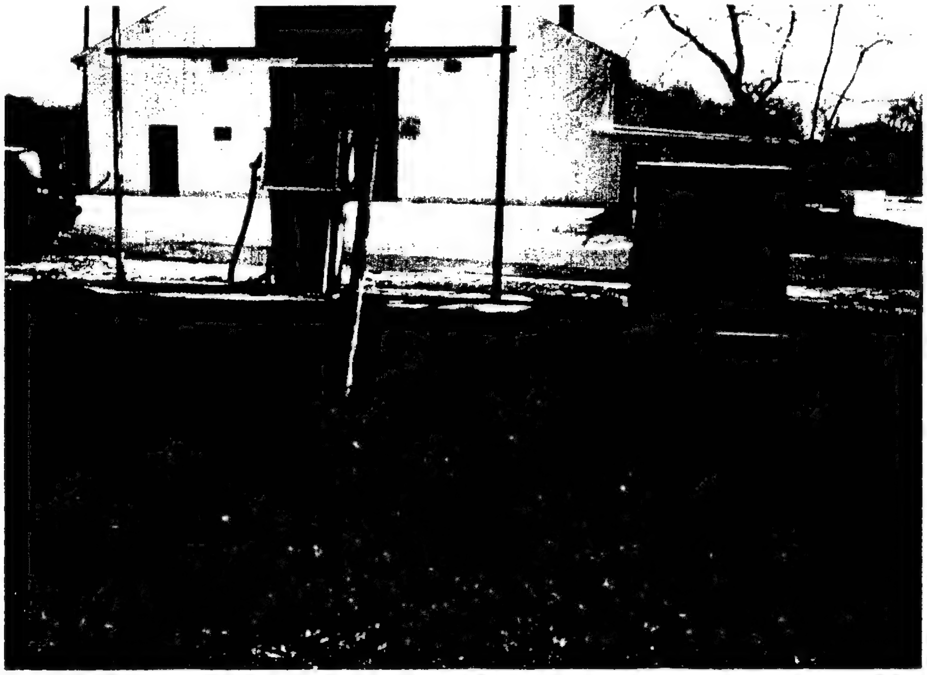


PHOTOGRAPH 19

PHOTOGRAPH 20

PHOTOGRAPH 21

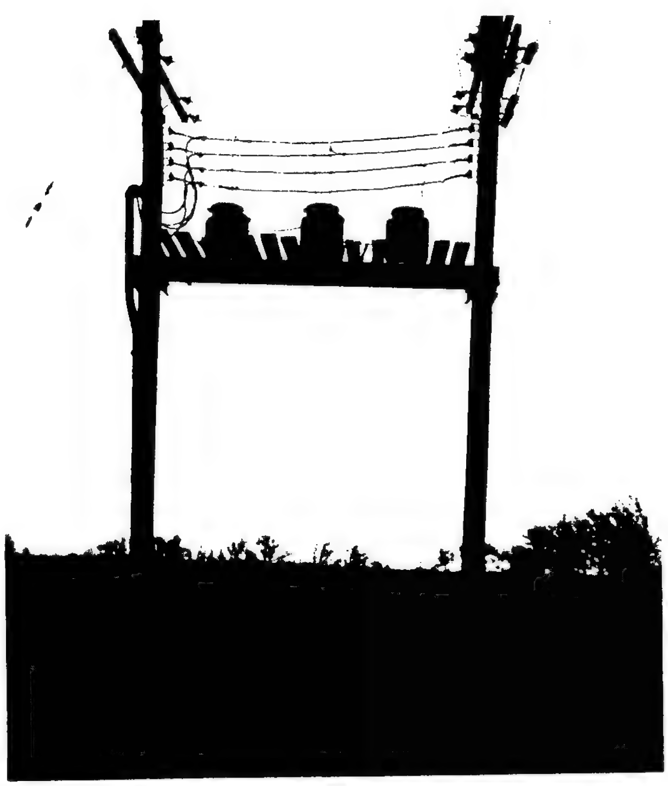

PHOTOGRAPH 22



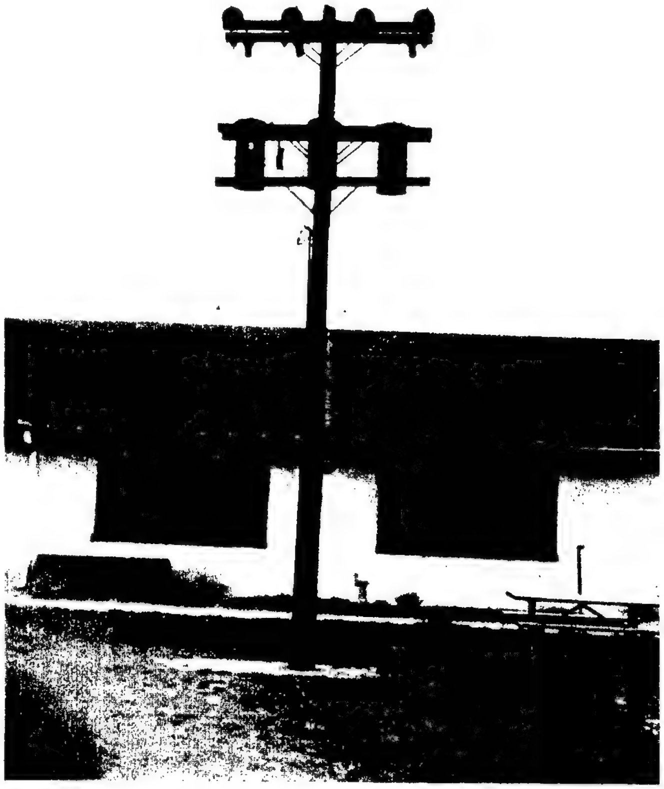
**PHOTOGRAPH 23**

**PHOTOGRAPH 24**

PHOTOGRAPH 25

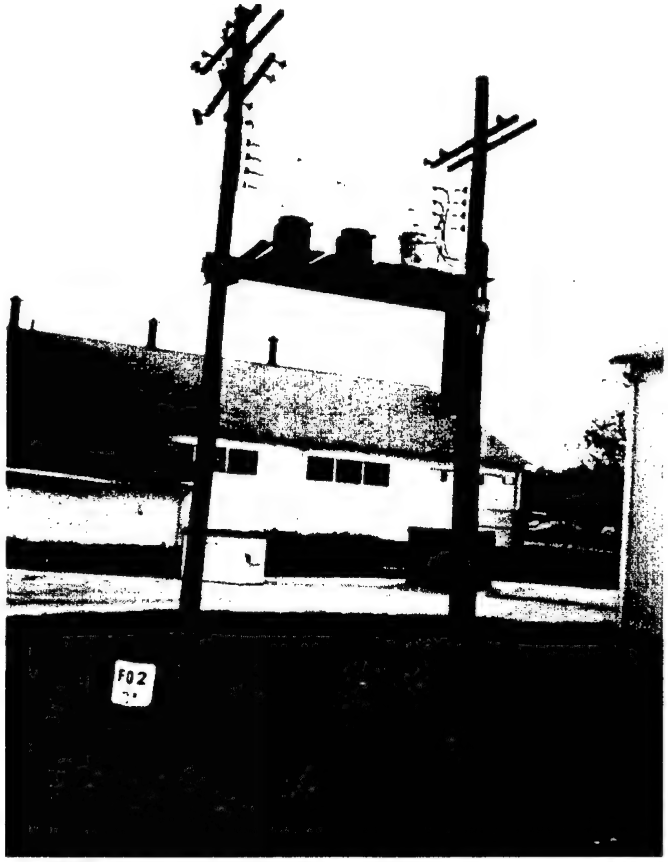


PHOTOGRAPH 26

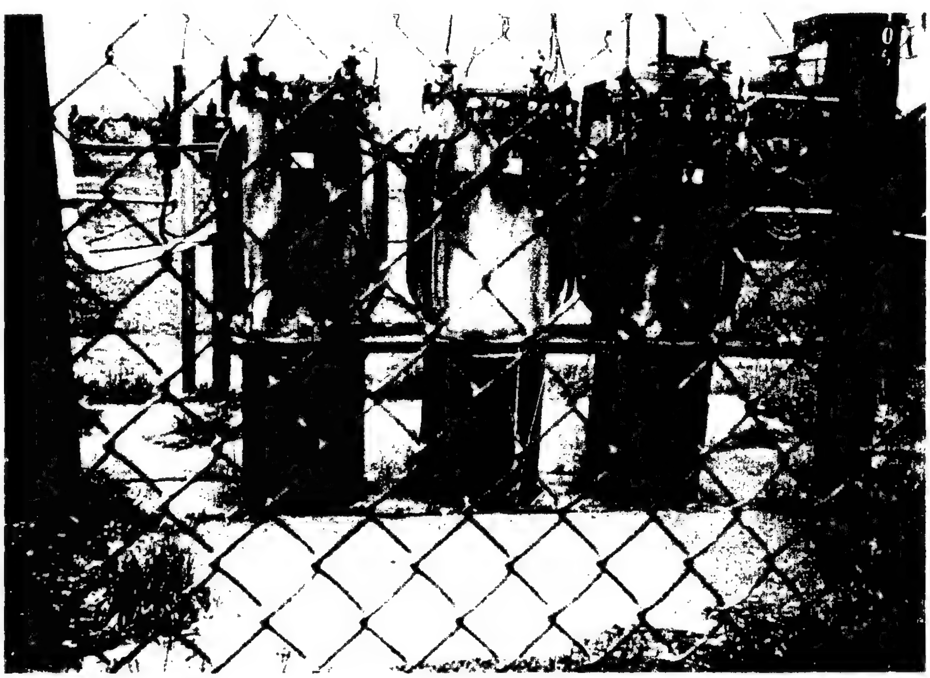


PHOTOGRAPH 27

PHOTOGRAPH 28



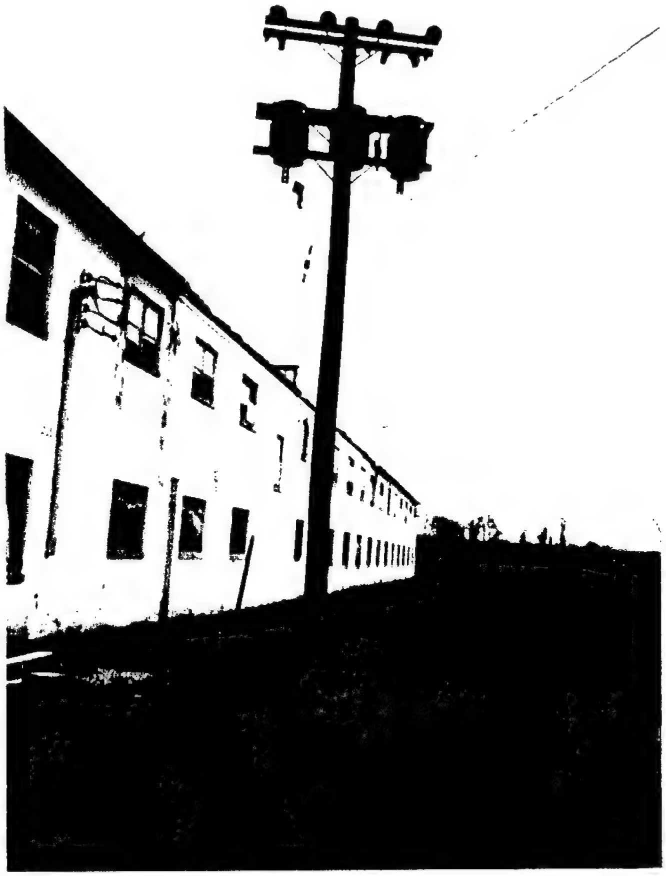

**PHOTOGRAPH 29**



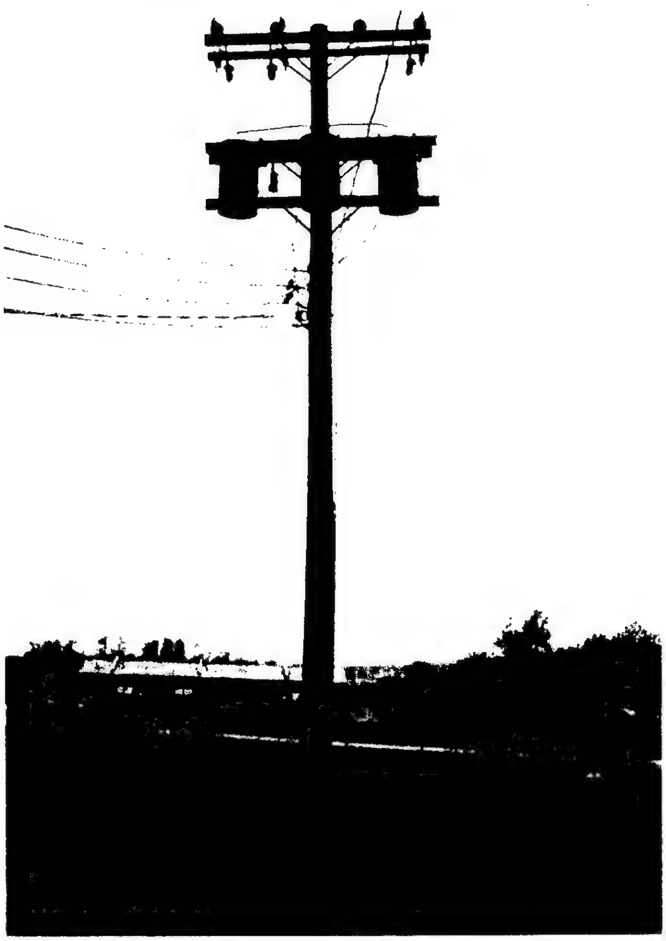
**PHOTOGRAPH 30**

PHOTOGRAPH 31

PHOTOGRAPH 32

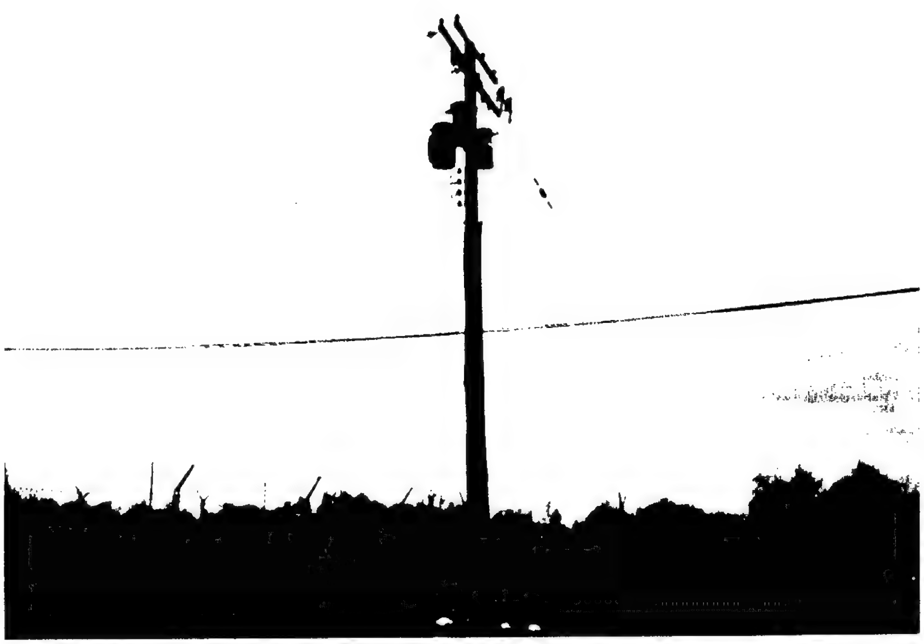


PHOTOGRAPH 33

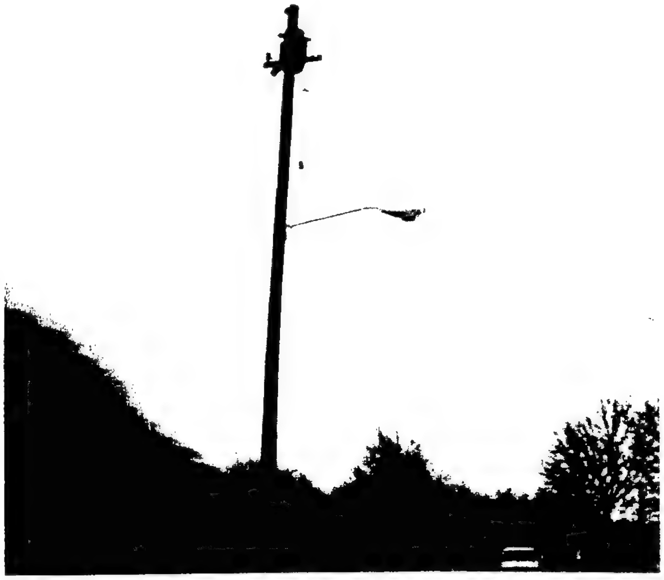


PHOTOGRAPH 34

PHOTOGRAPH 35

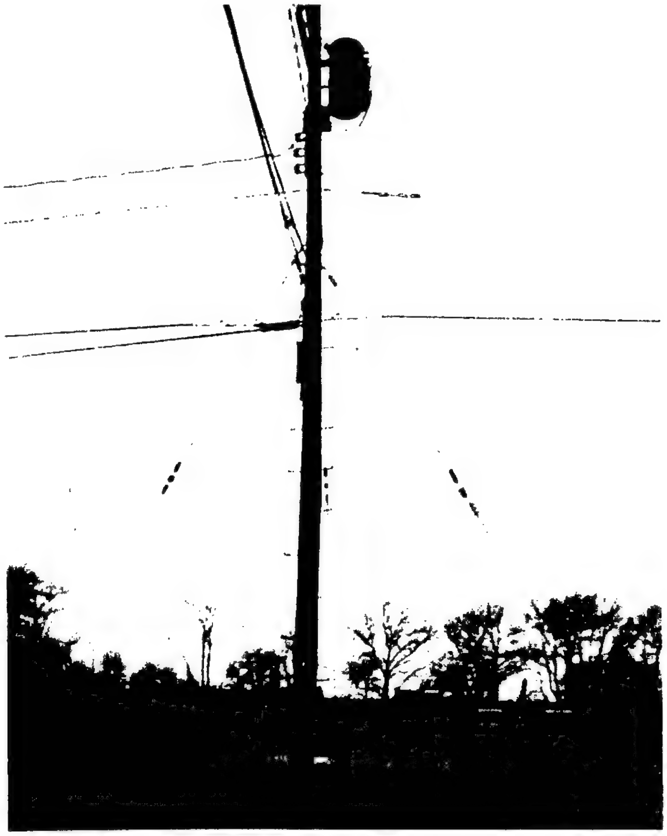


PHOTOGRAPH 36



PHOTOGRAPH 37

PHOTOGRAPH 38



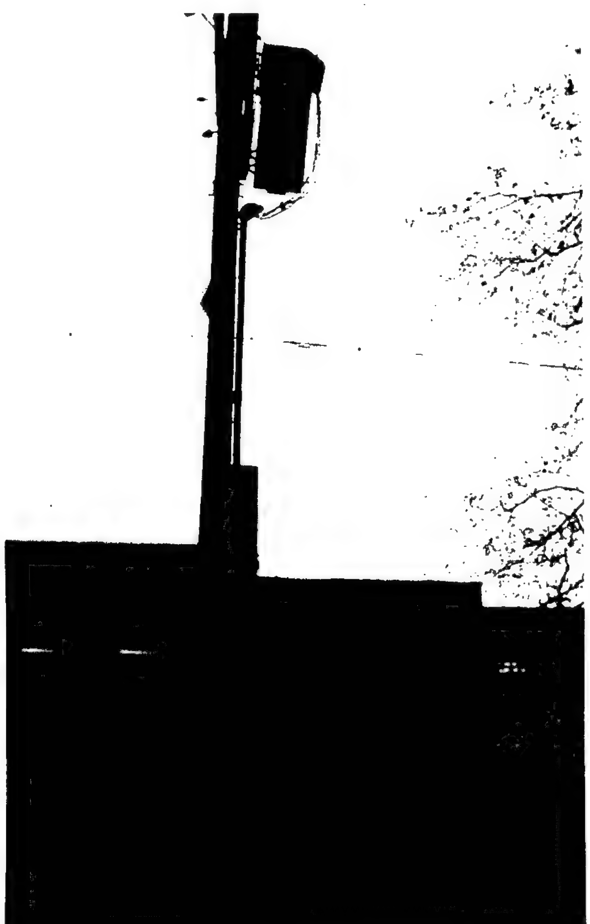
PHOTOGRAPH 39

PHOTOGRAPH 40

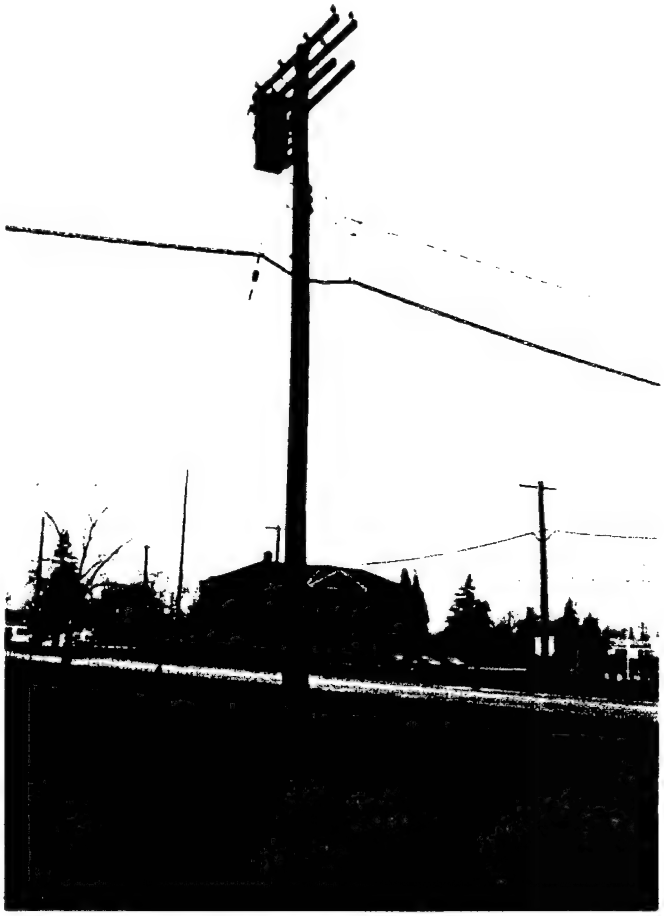
PHOTOGRAPH 41

PHOTOGRAPH 42

PHOTOGRAPH 43



PHOTOGRAPH 44



PHOTOGRAPH 45

PHOTOGRAPH 46

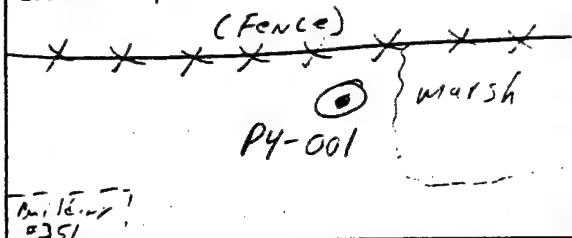
# BOREHOLE LITHOLOGIC LOGS

PEDRICKTOWN SUPPORT FACILITY
SALEM COUNTY, NEW JERSEY

## Legend for Soil Boring Logs

| | |
|---|---|
| (S) | Surface Soil Sample |
| (SS) | Subsurface Soil Sample or Splitspoon |
| (GT) | Geotechnical Soil Sample |
| (NA) | Non-Applicable |
| (T.D.) | Total Depth |
| (Lt. G.) | Light Grey |
| (BK.) | Black |
| (Br.) | Brown |
| (Dr. Br.) | Dark Brown |
| (LBR.) or (Lt. Br.) | Light Brown |
| (Tr.) | Trace |
| (Med. Gr.) | Medium Grained |
| (Sub.ang.) | Subangular |
| (Sub.rd.) | Subrounded |
| (Qtz.) | Quartz |
| (PVC) | Polyvinyl Chloride |
| (HSA) | Hollow Stem Auger |
| (ESI) | Expanded Site Inspection |
| (HNu) | HNu (brand) photoionization detector |
| (^) | Increases |
| (~) | Approximately |

Location Map




**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

## TEST HOLE/WELL LOG

Page 1 of 2

| | |
|---|---|
| Test/Well Number: PY-001 | Project: Pedricktown ESI |
| Date: 6-3-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder |
| Grout: Cement/Bentonite | |
| Casing Type: PVC | Diameter: 2" Length: ~~8'~~ 5.16' |
| Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 2" Length: 10' |
| Total Depth: 32' | Depth to Water: 6' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | ~~Staining~~ Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence |
|---|---|---|---|---|---|---|---|---|---|---|
| SP | 7.5YR 5/4 | | | | 0 | 0953 | | 2' | 60% | 3/4, 3/4 |
| | | | | | .2 | 0935 | | 4' | 60% | 5/9, 17/32 |
| | | 6' ▽ | | | 0 | 0959 | GT | 6' | 60% | 5/5 |
| GW | | | | | 0 | 1016 | | 8' | 30% | 7/12 |
| SW | 10YR 5/8 | | | | 1.0 | 1023 | | 10' | 40% | 5/11, 17/20 |
| | | | | | | | | 12' | | |
| | | | | | | | 15' | 14' | | 13/28 |
| GP | | | | | 1.0 | 1045 | 17' | 16' | 100% | 24/25 |
| | | | | | | | | 18' | | |
| | | | | | | | | 20' | | |
| SP | 2.5Y N7/ | | | | 0 | 1103 | | 22' | 50% | 22/19, 24/23 |
| | | | | | | | | | | 18/22, 25/32 |

### LITHOLOGY/REMARKS

0-2' Light brown, sand, fine to medium, subangular, moist, well sorted; First couple of inches dark humus.

2'-4' Same as above

4'-6' Same as above, moist-wet

6'-8' Light brown, sand & gravel; (10%), fine, subangular, wet sand; (90%), course, hard, subrounded to subangular, gravel (quartz, feldspar, possible biotite); poorly sorted

8'-10' Brown, sand & gravel; (60%), fine to medium, subangular, wet sand; (40%), course, subangular to subrounded, hard, gravel (quartz, chert); poorly sorted

15'-17' Course, hard, subangular to subrounded, well sorted, gravel (quartz).

20'-22' (20'-21.5'); Grey, sand & gravel; (80%); course subangular to subrounded, wet, sand; (20%), course, hard, subangular to subrounded, gravel (quartz); well sorted

(21.5'-22') Course, hard, subangular to subrounded, well sorted, gravel (quartz, possible chert).

### WELL COMPLETION

Grout, Seal, Solid, Gravel Pack, T.D. 13'

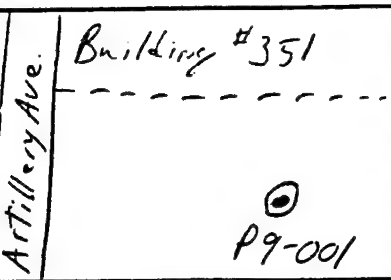
Location Map

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG — Page 2 of 2

| | |
|---|---|
| Test/Well Number: P4-001 | Project: Pedricktown ESI |
| Date: 6-3-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: Hnu |
| Drilling Method: Hollow Stem Auger | Sampling Method: Splitspoon |
| Gravel Pack: # 1 Sand | Seal: Bentonite Powder |
| Grout: Cement/Bentonite | |
| Casing Type: PVC | Diameter: 2" Length: ~~5~~ 5.16 |
| Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 2" Length: 10' |
| Total Depth: 32' | Depth to Water: 6' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | ~~Sample~~ Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GP | 2.5Y N7/ | | | | | | | 22' | | | | |
| | | | | | | | | 24' | | 11/15 | $\boxed{25'-27'}$ (25'-26.5'); same as interval (20-21.5') | |
| | | | | | 0 | 1121 | 25'-27' | 26' | 55% | 18/24 | | |
| CL | 10R 4/6 | | | | | | | 28' | | | (26.5'-27'); Mottled red & white clay, wet, stiff to plastic, with traces of sand. | |
| | | | | | .2 | 1159 | | 30'-32' | 70% | | | |
| | | | | | | | | | | 15/22 24/26 | $\boxed{30'-32'}$ same as above, no traces of sand present | |
| | | | | | | | | | | | (T.D. of boring: 32') | |

| Location Map | |
|---|---|
|  | |



**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

# TEST HOLE/WELL LOG



| | | | |
|---|---|---|---|
| Test/Well Number: P9-001 | Project: Pedricktown ESI | | |
| Date: 6-2-93 | Project Number: 2060.000 | | |
| Logged By: EJA | Drilled By: JCA | | |
| Elevation: | Detector: HNU | Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: Cement/Bentonite |
| Casing Type: PVC | | Diameter: 2" Length: ~~3~~4.81' | Hole Dia: 8" / Depth to Liquid: — |
| Screen Type: PVC | Slot: .10 | Diameter: 2" Length: 10' | Total Depth: 33' / Depth to Water: 6' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 7.5YR 6/8 | | | | 0 | 0850 | | 2' | 75% | 3/4/4/6 | 0'-2' Brown, sand, fine to medium, subangular, semi-moist, well sorted |
| | | | | | 0 | 0900 | | 4' | 75% | 5/7/6/13 | 2-4' same as above; moist |
| | | 6' ▽ | | | 1.0 | 0905 | | 6' | 75% | | |
| SW | | | | | 1.0 | 0910 | | 8' | 40% | 3/4/4/7 | 4-6' Same as above; moist-wet |
| | | | | | .5 | 0927 | GT | 10' 12' | 40% | 13/23/27/21 | 6-8' Brown, sand & gravel; 80%) fine to medium, subangular wet sand; (20%) course, angular to subangular, gravel, poorly sorted |
| | 10YR 5/6 | | | | .4 | 1000 | 15'-17' | 14' 16' | 50% | 14/24/21/29 | 10'-12' Same as above [15'-16' same as above] |
| GP | | | | | .8 | 1021 | | 18' 20' 22' | 50% | 15/23/32/41 | 15-17' Brown, sand & gravel, (40%), fine to medium wet subangular, wet, sand; (60%), course, subangular to subrounded, gravel, well sorted, 16.7' light grey clay |
| SP | | | | | .6 | 1045 | 25'-27' | 24' 26' | 75% | 13/26/34/43 | 20'-22' Same as above, no clay lens noted |
| CL | 10R 4/6 | | | | | | | 28' | 0% | | |
| | 10R 5/6 | | | | 1.0 | 1110 | 29'-31' | 30' | 40% | 5/11/15/16 | 25'-27' Light Brown, sand, course, subangular, wet, well sorted, 26.5' red clay lens noted |
| | | | | | | | | | | 12/16/18/21 | 27'-29' no sample recovered (red clay on outside of spoon) |
| | | | | | | | | | | 9/14/17/23 | 29-31' mottled red & white clay wet, stiff to plastic |

WELL COMPLETION: Grout; Seal; Solid; Gravel Pack; T.D. 13'

* Continued on Next Page *

Location Map

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

## TEST HOLE/WELL LOG



| | |
|---|---|
| Test/Well Number: P9-001 | Project: Pedricktown ESI |
| Date: 6-2-93 | Project Number: 2060.000 |
| Logged By: EJA | Drilled By: JCA |

| | | | |
|---|---|---|---|
| Elevation: | Detector: Hnu | Drilling Method: Hollow Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: Cement/Bentonite |
| Casing Type: PVC | | Diameter: 2" Length: 4.81 | Hole Dia: 8" / Depth to Liquid: — |
| Screen Type: PVC | Slot: .10 | Diameter: 2" Length: 10' | Total Depth: 33' / Depth to Water: 6' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CL | 10R 5/6 | | | | .4 | 1125 | 31'–33' | 32' | 40% | 10/18 22/24 | 31'–33' Same as above (T.D. of boring: 33') | |
| | | | | | | | | 34' | | | | |
| | | | | | | | | 36' | | | | |

*Note*
original bore hole caved in when trying to put in piezometer. Reset drill rig next to original bore hole and drilled to 13' BG (below grade) to install P9-001.

Location Map
Building #454

Depot Ave.

@ P15-001

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG — Page 1 of 2

| | | | |
|---|---|---|---|
| Test/Well Number: P15-001 | Project: Pedricktown ESI | | |
| Date: 6-4-93 | Project Number: 2060.000 | | |
| Logged By: E. Ashton | Drilled By: JCA | | |
| Elevation: | Detector: HNu | Drilling Method: Hollow Stem Auger | Sampling Method: split spoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: Cement/Bentonite |
| Casing Type: PVC | | Diameter: 2" Length: ~~8~~ 5.03' | Hole Dia: 8" Depth to Liquid: |
| Screen Type: PVC | Slot: .10 | Diameter: 2" Length: 10' | Total Depth: 36' Depth to Water: 4' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample ~~Staining~~ Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 7.5YR 4/6 | | | | 0 | 0839 | | 0-2' | 70% | 7/7 10/8 | 0'-2' Brown, sand, fine to medium, moist, subangular subrounded, well sorted; Top ½" dark humus. |
| | | 4' ▽ | | | 0 | 0841 | | 2-4' | 75% | 5/5 9/15 | 2-4' same as above, moist to wet at 3.5' |
| | | | | | 0 | 0846 | | 4-6' | 75% | 5/5 6/6 | 4'-6' Same as above, wet sand |
| | | | | | 0 | 0855 | | 10-12' | 80% | 8/11 21/23 | 10-12' Brown, sand, medium, generaly the same as above. |
| | 7.5YR 5/4 | | | | .2 | 1000 | 15'-17' | 16 | 40% | 10/12 15/18 | 15-17' same as above, lost 1" of spoon has few fragments of gravel. |
| SW / CL | 10YR 3/1 | | | | 0 | 1012 | GT | 20-22' | 50% | 6/8 7/9 | 20-22' (20'-20.5', Brown, sand & gravel; 90%), medium to course, wet, subangular to subrounded, Sand; 10%) course, subangular to subrounded, gravel (hard quartz); poorly sorted. (20.5'-22') Black clay, semi-plastic, wet. |
| GW | 10YR 5/4 | | | | 0 | 1028 | 25'-27' | 26 | 55% | 12/15 23/31 | 25-27' Gray, sand & gravel; (40%), medium, subangular to subrounded, wet, sand; (60%), course, subangular to subrounded, hard, gravel (quartz); poorly sorted |

*continued on Next page.

WELL COMPLETION
Grout
Seal
Solid
Gravel/Pack
T.D. 13'

Location Map

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## TEST HOLE/WELL LOG



| | | | |
|---|---|---|---|
| Test/Well Number: P15-001 | | Project: Pedricktown ESI | |
| Date: 6-4-93 | | Project Number: 2060.000 | |
| Logged By: E. Ashton | | Drilled By: JCA | |
| Elevation: | Detector: HNu | Drilling Method: Hollow Stem Auger | Sampling Method: Splitspoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: Cement/Bentonite |
| Casing Type: PVC | | Diameter: 2" Length: 5.03 | Hole Dia: 8" Depth to Liquid: |
| Screen Type: PVC | Slot: .10 | Diameter: 2" Length: 10' | Total Depth: 36' Depth to Water: 4' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample ~~Staining~~ Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GW | 10YR 5/4 | | | | | | | 28' | | | | |
| CL | 5YR 5/8 | | | | 0 | 1048 | | 30' | 40% | 12/20 31/38 | 30'-32' Mottled orange & red clay, stiff to plastic, wet; traces of sand. | |
| | | | | | | | | 32' | 0% | 13/17 25/29 | 32'-34' No sample recovered | |
| | | | | | | | | 34' | 0% | 19/24 25/35 | 34'-36' No sample recovered (clay outside of spoon) | |
| | | | | | | | | 36' | | | | |

(T.D. of boring: 36')

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## TEST HOLE/WELL LOG

Page 1 of 1

Location Map: MW2-001 ; Building # 380 ; Artillery Ave

| | |
|---|---|
| Test/Well Number: MW2-001 | Project: Pedricktown ESI |
| Date: 6-8-93 | Project Number: 2060.010 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder |
| Grout: NA | |
| Casing Type: PVC | Diameter: 4" Length: 3.93 |
| Hole Dia: 12" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 4" Length: 10' |
| Total Depth: 16' | Depth to Water: 2.50' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | Lithology/Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SC | 5YR 2.5/2 | | 15 | | 0 | 0815 | S | 0-2 | 90% | 3/2, 3/2 | (0-2') (1-1.8'): Dark brown, sand with (15%) clay matrix, fine to medium, subangular, moist, well sorted. |
| SP | 2.5YR N6/ | 2.5' | | | | | | | | | (1.8'-2.0'): Light gray, sand, fine to medium, subangular, wet, well sorted |
| SC | 7.5YR 4/6 | | 20 | | 0 | 0826 | SS 2 | 2-4 | 90% | 6/7, 7/5 | (2'-4') (2'-3'): Same as interval (1.8'-2') (3'-4'): Light orangish brown, sand with clay matrix, fine to medium, subangular, wet, well sorted; 10% fines (clay & silt) |
| SP | 7.5YR 5/4 | | | | 0 | 0840 | | 9-11 | 80% | 7/9, 12/12 | (9-11) Light brown, sand, fine to medium, subangular, wet, well sorted |
| SC | | | 15 | | 0 | 0918 | GT | 14-16 | 90% | 4/5, 6/7 | (14-16) (14'-15') Same as above. (15-16) Light brown, sand, with fines, fine to medium, wet, subangular to subrounded, well sorted; 15% fines present (clay & silt) Trace of gravel |

(T.D. of boring: 16')

Well Completion: Solid; Gravel Pack; T.D. 12'

Location Map

⊙ MW7-001

Building #188

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## TEST HOLE/WELL LOG

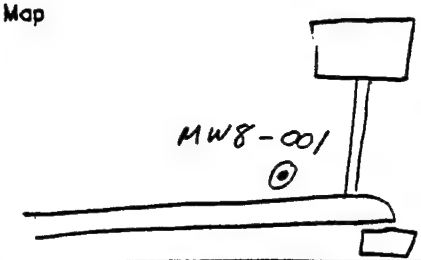
Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW7-001 | Project: Pedricktown ESI | | |
| Date: 6-7-93 | Project Number: 2060.000 | | |
| Logged By: Bond | Drilled By: JCA | | |
| Elevation: | Detector: Hnu | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: ~~3.5~~ 3.64 | Hole Dia: ~~4~~ 8" ; Depth to Liquid: |
| Screen Type: PVC | Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 11.5' ; Depth to Water: 2.0' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | ∇ 2.0 | >15 | | 0 | 1438 | S | | 20 | 3/2, 1/1 | 0-8" - Bk. Sandy Humas | |
| | 7.5 YR 5/8 | | | | 0 | 1443 | SSA | | 12" | 1/1, 1/1 | 8"-2' - Sand - Tan & LBR.; fine-med gr.; subang.- sub. rd.; >15% fines; non-cohesive Tr. fine gravel & coarse sand water at base of spoon | |
| | | | | | | | | 5 | | | | |
| SM | | | >15 | | 0 | | | 10 | 24 | 15.20, 18.21 | 2-4' Sand - as above grading to coares gr. sand w/ LT. Gray color | 11.5' T.D. |
| SW | | | <5 | | | | | | | | 9-11' sand - 12" Tan sand as above grading to very coarse gr. sand and fine gravel: sub-rd.- to sub. ang.; poorly sorted; hard; | |

(T.D. of boring: 11.5')

Location Map





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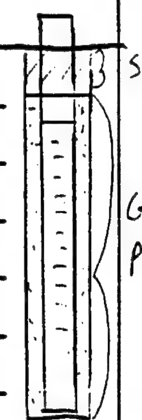
## TEST HOLE/WELL LOG



| | | | |
|---|---|---|---|
| Test/Well Number: MW8-001 | Project: Pedrick Town ESI | | |
| Date: 6-7-93 | Project Number: 2060.000 | | |
| Logged By: Bond | Drilled By: JCA | | |
| Elevation: | Detector: HnU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | Diameter: 4" Length: ~~2.5~~ 2.85 | Hole Dia: ~~4~~ 8 | Depth to Liquid: |
| Screen Type: PVC Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 14' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | ∇ 3.0 | >15 | | 0 | 1230 | S | | 20 | 7/7 8/6 | 0-8" Dr. Br Humus, sandy; |
| | -- 7.5 YR 5/8 | | >15 | | 0 | 1240 | SS A | | 18' | 7/7 7/6 | 8"-2' SAND; TAN; fine-med gr.; subrd.; >15% fines; Trace gravel; angular; hard.; NON-cohesive. 1" thick clay @14"BG; TAN; cohesive |
| | | | | | | | | 5 | | | |
| SM | | | >15 | | 0 | | GT | 10 | 24 | 9/20 24/20 | 2-4' SAND; As above; no clay water at 3' BG. |
| | | | <15 | | 0 | | | | 20" | 20/7 7/10 | |
| | | | | | | | | 14 | | | |
| SM | | | | | | | | | | | 9-11' Sand: Tan grading to Lt gray; very coarse to med gr. >15% fines; ~10% gravel; poorly sorted; sub-ang. - sub. rd.; gravel sub rd; hard. 10.5" - 3" SILT LAYER; Tan non-cohesive. |
| | | | | | | | | | | | 12-14' SAND & gravel As above |
| | | | | | | | | | | | (T.D. of boring: 14') |

WELL COMPLETION



Location Map

Fence

MW10-001

AGT #461

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## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW10-001 | Project: Pedricktown ESI |
| Date: 6-8-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: HNU |
| Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: # 1 Sand | |
| Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | Diameter: 4" Length: 3.96 |
| Hole Dia: 12" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 4" Length: 10' |
| Total Depth: 16' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Top Soil | 7.5YR 5/8 | | | | .2 | 1105 | S | 0'–2' | 80% | 3/4, 5/4 | 0-2' (0'-1'): Humus c slight black stained soil; (1'-2'): organish brown, sand, fine to medium, subangular, moist-wet, well sorted | Solid |
| SP | | 3' | | | 0 | 1108 | SS# A | 2'–4' | 80% | 3/2, 1/2 | 2'-4' Same as interval (1'-2'), wet | |
| p-SM | 7.5YR 5/4 | | | | .4 | 1119 | | 9'–11' | 100% | 5/8, 9/11 | 9'-11' Brown, sand, fine to medium, subrounded, wet, well sorted; Black staining on soil surface first "2" of sample. | Gravel Pack |
| SP-SM / SC | 5YR 7/1 | | | | 0 | 1135 | GT | 14'–16' | 60% | 9/7, 8/9 | 14'-16' (14'-15.5'): Same as interval (9'-11'); (15.5'-16'): Gray, sand c gravel; (45%) fine to medium, subrounded, wet, sand; (40%), course, subrounded to subangular, hard, gravel (quartz); 15% fines (clay c silt), poorly sorted | T.D 12' |

(T.D of boring: 16')

Location Map

(Fence)

MW11-001

Concrete Pad

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TEST HOLE/WELL LOG — Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW11-001 | Project: Pedricktown ESI |
| Date: 6-7-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: HNU |
| Drilling Method: Hollow Stem Auger | Sampling Method: split spoon |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder |
| Grout: Cement/Bentonite | |
| Casing Type: PVC | Diameter: 4" Length: 4.09 |
| Hole Dia: 12" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 4" Length: 10' |
| Total Depth: 15' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 7.5YR 3/2 | | | | 0 | 1129 | S | 1' | 85% | 4/5 6/4 | 0-2 Brown, sand, medium, subangular, moist, well sorted; pieces of glass; lens of black stained soil (0-1/4') (possible ash). |
| | 7.5YR 5/6 | 3' ▽ | | | 0 | 1137 | SSA | 3' | 40% | 4/4 3/3 | 2'-4' Light Brown, sand fine to medium, subangular wet, well sorted |
| | | | | | 0 | 1147 | GT | 9' | 95% | 5/7 6/7 | 8'-10' same as above, medium sand |
| SW | | | | | 0 | 1210 | | 14' | 30% | 6/8 12/15 | 13'-15' (13'-14.5') same as above (14.5'-15'): Light brown, sand & gravel; (60%), fine to medium, subangular, wet sand; (40%), course, hard, subrounded to subangular, gravel (quartz) some fines (clay; silt) may be present, hard to tell in sample. |

WELL COMPLETION

Grout

Seal

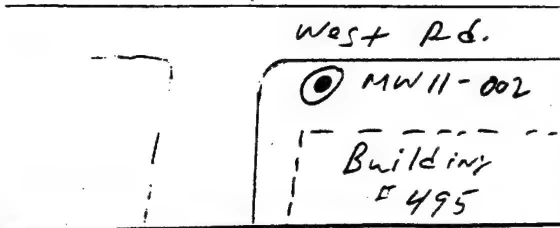
Solid

Gravel Pack

T.O. 12'

(T.D. of boring: 15')

Location Map

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# TEST HOLE/WELL LOG

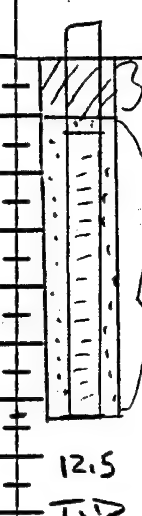
Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW11-002 | Project: Pedricktown ESI |
| Date: 6/8/93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |
| Elevation: | Detector: HnU |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 sand | Seal: Bentonite Powder |
| Grout: NA | |
| Casing Type: PVC | Diameter: 4" Length: ~~4.5~~ 4.59 |
| Hole Dia: ~~X~~ 8" | Depth to Liquid: |
| Screen Type: PVC Slot: 0.10 | Diameter: 4" Length: 10' |
| Total Depth: 12.5 | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 7.5YR 5/8 | ∇ 3' | >15 | | 0 | 0834 | S | | 20 | 4-4 5-4 | 0-.5' Sand - Tan; LBR.; fine-med. gr.; sub. rd.; poorly sorted; ≥15% fines; non-cohesive; Trace gravel; sub rd.; hard; 2-3cm. |
| | | | | | 0 | 0834 | SS# A | | 20 | 4-4 4.4 | .5-2' Sand - Bk. Br./Tan color; As above |
| | | | | | | | | 5 | | | 2'-4' sand As above |
| SM | | | | | 0 | | GT | 10 | 18 | 5.7 9.10 | water at ~3.0' BG |
| | | | ≥15 | | | | | 12.5 | | | 9'-11' Sand - Tan-LBR.; fine-coarse gr.; sub. rd.-Sub. Ag.; poorly sorted; ≥15% fines; non-cohesive; Tr. gravel; 2-3cm.; sub.rd.; hard. |

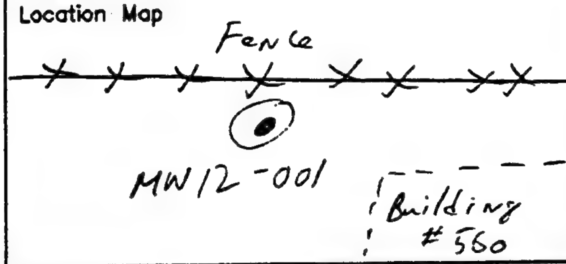
(T.D. of boring: 12.5')

WELL COMPLETION




GT

Location Map

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## TEST HOLE/WELL LOG

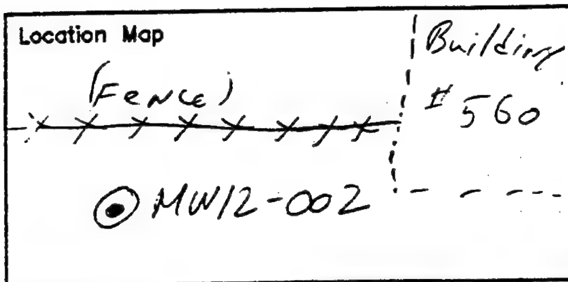
Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW12-001 | | Project: Pedricktown ESI | |
| Date: 6-8-93 | | Project Number: 2065 010 | |
| Logged By: E Ashton | | Drilled By: JCA | |
| Elevation: | Detector: HNu | Drilling Method: Hollow Stem Auger | Sampling Method: Splitspoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: ~~3.5~~ 3.96 | Hole Dia: 12" / Depth to Liquid: |
| Screen Type: PVC | Slot: .10 | Diameter: 4" Length: 10' | Total Depth: 16' / Depth to Water: 2' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample ~~Heating~~ time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 10YR 2/2 | | | | 0 | 1409 | S | 0'–2' | 60% | 2/2 2/1 | (0'-2') Brown, sand, fine to medium, subrounded, moist, well sorted. First few inches dark to black humus. | Solid / Seal |
| | 7.5YR 4/6 | 2' ∇ | | | 0 | 1412 | SS#A | 2'–4' | 30% | 1/1 1/1 | (2'-4') Same as above, wet, lighter shade of brown. | Gravel Pack |
| SM / SC | 5YR 3/1 | | 5 | | 0 | 1431 | GT | 9'–11' | 60% | 5/5 7/7 | (9'-11') (9-10): same as interval (2'-4'); (10'-10.3') Dark brown, sand with fines; (90%), fine, well sorted, subrounded, wet, sand; (5%) fines (clay; silt); (10.3'-11') same as interval (2'-4') | |
| SP / SM | 7.5YR 4/6 | | | | | | | | | | | |
| | | | | | 0 | 1446 | | 14'–16' | 80% | 4/7 10/14 | (14'-16') Light brown, sand, fine, subrounded, wet, well sorted. Last 1" of sample had small percentage of gravels. | T.D. 11.5' |

(T.D. of boring: 16')

Location Map

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## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW12-002 | Project: Pedricktown ESI |
| Date: 6-9-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder |
| Grout: NA | Casing Type: PVC |
| Diameter: 4" | Length: ~~3.5~~ 3.53 |
| Hole Dia: 12" | Depth to Liquid: |
| Screen Type: PVC | Slot: .10 |
| Diameter: 4" | Length: 10' |
| Total Depth: 16 | Depth to Water: 2.5 |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 5YR 3/1 | | | | 0 | 0833 | S | 1' | 40% | 4/4 4/4 | 0'-2' (0'-1') Dark brown Humus; sand, fine to medium, subrounded, moist, well sorted; (1'-2') Black stained soil (possible ash). | |
| NA | NA | | | | | | | 2' | | | | |
| SP | 7.5YR 4/6 | 2.5' ▽ | | | 0 | 0837 | SS-4 GT | 3' | 60% | 4/2 1/1 | 2'-4' Light brown, sand, fine to medium, subrounded, wet, well sorted. | |
| | | | | | .2 | 0845 | | 9'–10' | 90% | 7/12 12/18 | 9'-11' Same as above. | Gravel Pack |
| | | | | | .4 | 0855 | | 15' | 80% | 5/8 13/17 | 14'-16' Same as above, except medium grained sand with (5%) of course, subangular to subrounded, hard (quartz) gravel at the last 1' of spoon. | T.D. 11.5' |
| | | | | | | | | 16'–21' | | | (T.D. of boring: 16') | |

GT
sp. sm

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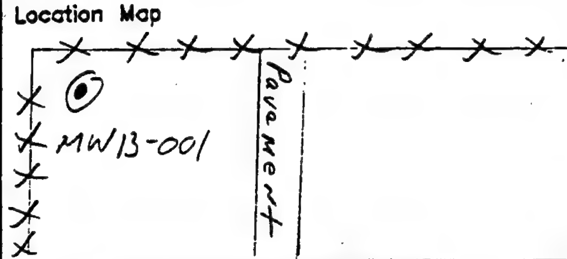
Location Map



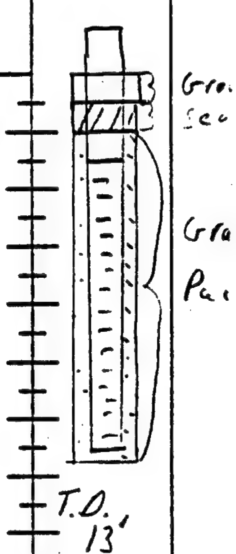

# TEST HOLE/WELL LOG

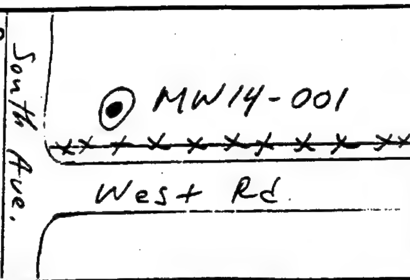
| | |
|---|---|
| Page 1 of 1 | |
| Test/Well Number: MW13-001 | Project: Pedricktown ESI |
| Date: 6-3-93 | Project Number: 2060.000 |
| Logged By: BOND | Drilled By: JCA |
| Elevation: | Detector: HnU |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 SAND | Seal: BENTONITE Powder |
| Grout: Bentonite / Cement | |
| Casing Type: PVC | Diameter: 4" Length: 4.86 ~~8~~ |
| Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: 0.10 | Diameter: 4" Length: 10' |
| Total Depth: 15' | Depth to Water: 3.5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | | 15 | | 0 | 0830 | S | | 22" | 4/4 7/6 | 0-4" Dk. Br. / Bk. Humus; roots; sand fine to med. gr.; Broken Coal Fragments |
| | | ∇ 3.5 | | | 0 | 0842 | SSFA GT | | 24" | 3/2 2/2 | 4-20" TAN; Fine to med. gr.; subrd.; poor sort; sand w/ trace gravel; subrd; hard; moist; ~15% fines |
| | 7.5YR 5/8 | | | | | | SSB | 5 | 24" | 1/1 1/1 | DkBr. Clay; cohesive 2" thick |
| | | | | | | | | | | | TAN SAND: AS ABOVE |
| | | | | | | | | 10 | 24 | 5/6 7/11 | AS ABOVE |
| | | | | | | | | 13 | | 6/12 17/21 | As above w/ ↑ in gravel % ~20% subrd; hard; |

(T.D. of boring: 15')

WELL COMPLETION






Location Map

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

# TEST HOLE/WELL LOG

Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW14-001 | Project: Pedricktown | | |
| Date: 6-8-93 | Project Number: 2060.000 | | |
| Logged By: Bond | Drilled By: JCA | | |
| Elevation: | Detector: HNU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder | | Grout: NA |
| Casing Type: PVC | Diameter: 4 | Length: ~~3.5~~ 3.56 | Hole Dia: ~~4~~ 8" / Depth to Liquid: |
| Screen Type: PVC / Slot: 0.10 | Diameter: 4 | Length: 10' | Total Depth: 11.5' / Depth to Water: 2' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10.YR 2/1 | ▽ 2' | Z15 | | 0 | 1437 | S. | | 18 | 3-3 / 6-8 | 0-4" - Humus - Dr.Br.; sandy |
| | 7.5YR 5/8 | | Z15 | | 0 | 1440 | SS#A | | 20 | 2-3 / 3-4 | 4"-22" sand - TAN-LBR; fine-med gr.; sub rd - sub ang; Z15% fines; non-cohesive; Tr. gravel - 1cm; sub.rd., hard; |
| | | | | | | | | 5 | | | |
| SM | | | | | | | | | | | 22"-24" Bk. Layer; coal fragments; ash; HNU - 0ppm; sandy |
| SW | | | 10 | | 0 | | GT | 10 | 20 | 4-9 / 11-11 | |

2'-4' sand - as above

9-11' sand - as above ↑ in coarse sand ↓ in fines

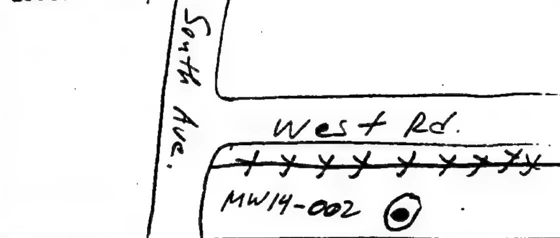
T.O. of boring: 11.5'

WELL COMPLETION

11.5' T.D

GT ~~P~~

| Location Map | **Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211 |
|---|---|




## TEST HOLE/WELL LOG

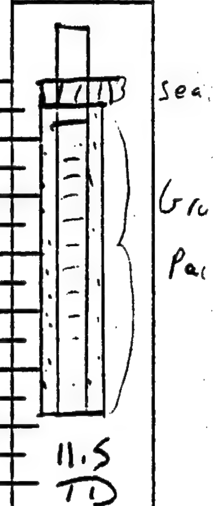
Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MN 14-002 | Project: Pedricktown ESI | | |
| Date: 6.8.93 | Project Number: 2060.000 | | |
| Logged By: Bond | Drilled By: JCA | | |
| Elevation: | Detector: HnU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: ~~3.5~~ 3.43 | Hole Dia: ~~4"~~ 8" / Depth to Liquid: |
| Screen Type: PVC | Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 12' / Depth to Water: 2' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Staining | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | ▽ 2' | 25 | | 0 | 1333 | S | | 18 | 4-6 / 6-6 | 0-6" Humus - Dk.Br; sandy |
| | 7.5YR 5/8 | | | | 0.5 | 1337 | SS B | | 20 | 2-2 / 2-4 | 6"-2' sand - TAN-LBr.; fine-med. gr.; subrd -sub-ang.; poor sorted; ≥15% fines; non-cohesive; Tr. gravel; 2-3 cm.; subrd; hard. |
| SM | ↓ | | | | | | | 5 | | | |
| | | | | | 0 | | GT | 10 | 24 | 4-9 / 11-12 | 2-4' sand As above |
| SW | | | 10 | | | | | | | | 10-12' sand: As above; 4 in coarse sand and fine gravel. ~10% fines |

(T.D of boring: 12')

WELL COMPLETION



Location Map

MW15-001

Railroad Ave.

Building # 464

**Versar INC.** 2010 CABOT BLVD, LANGHORNE, PA 19047, (215) 741-4211

## TEST HOLE/WELL LOG



| | |
|---|---|
| Test/Well Number: MW15 001 | Project: Pedrick town ESI |
| Date: 6-8-93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |
| Elevation: | Detector: HnU |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 sand | Seal: Bentonite Powder |
| Grout: NA | |
| Casing Type: PVC | Diameter: 4" |
| Length: 4.48 ~~4.8~~' | Hole Dia: ~~4~~ 8" |
| Depth to Liquid: | |
| Screen Type: PVC | Slot: 0.10 |
| Diameter: 4" | Length: 10' |
| Total Depth: 13' | Depth to Water: 3' |

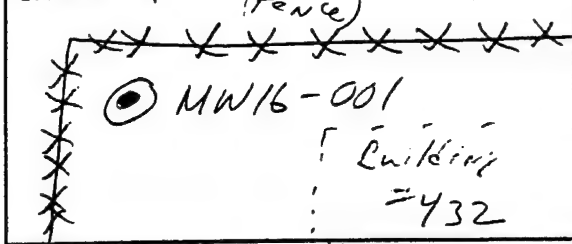
| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample ~~Starting~~ time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | | ≥15 | | 0 | 1023 | S | | 18" | 3-5 / 8-6 | 0-3" ~~Humus~~ - Dk. BR.; sandy |
| | 7.5 YR 5/8 | ▽ 3' | ≥15 | | 0 | 1027 | SS-A | | 24 | 3-3 / 4-5 | 3"-2' sand - TAN/LBR; very fine-med gr.; sub.rnd.-sub.Ang.; poor sorted; ≥15 % fines; NON-cohesive; Tr. gravel |
| SM | | | | | | | | 5 | | | |
| SW | | | 10 | | 0 | | GT | 10 | 24 | 5-9 / 13-10 | 2-4' sand As above w/ ↑ in corase gr. sand. water at 3' BG |
| SP-SM (GT) | | | | | | | | 13' | | | 10-12' sand: As above w/ less fines ~ 10% |

(T.D. of boring: 13')

WELL COMPLETION

12.5' T.D.

| Location Map | **Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211 |
|---|---|




## TEST HOLE/WELL LOG

Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW16-001 | Project: Pedricktown E I | | |
| Date: 6-9-93 | Project Number: 2060.000 | | |
| Logged By: E Ashton | Drilled By: JCA | | |
| Elevation: | Detector: HNu | Drilling Method: Hollow Stem Auger | Sampling Method: Split spoon |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder | Grout: NA | |
| Casing Type: PVC | Diameter: 4" Length: 4'3.75 | Hole Dia: 12" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 4" Length: 10' | Total Depth: 15' | Depth to Water: 3.5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SW | 7.5YR 4/6 | | | | 0 | 1212 | GT | 1' | 40% | 3/6 10/10 | 0-2' (0'-.25') dark, Black humus, (.25'-2') Brown, sand & gravel, (95%) fine to medium, sub rounded, dry to semi-moist, sand; (5%), course, hard, subrounded to subangular, gravel (quartz), poorly sorted | Solid; Seal |
| | | 3.5' ▽ | | | 0 | 1220 | SS#A | 3' | 30% | | 2-4' Same as above, wet @ 3.5' | |
| | | | | | 0 | 1223 | SS#B | 5' | 60% | 4/4 4/4 2/3 4/5 | 4-6' (4'-5.5') Brown, sand, fine to medium, wet, subrounded, well sorted (5.5'-6') (5%) of course, hard, subrounded to subangular gravel present with sand, poorly sorted | Gravel Pack |
| GW/GC | 7.5YR 5/6 | | 10 | | 0 | 1246 | | 9' | 20% | 10/12 15/22 | 8'-10' Light brown, sand & gravel, with fines; (40%), fine to medium, subrounded, wet, sand; (50%), course, subangular to subrounded, hard, gravel (quartz); (10%) fines (clay & silt); poorly sorted. | |
| GC | 10YR 7/1 | | 15 | | 0 | 1256 | | 14' | 40% | 9/14 20/18 | 13'-15' (13'-14') Same as above (14'-15') Almond, sand & gravel, with fines; (40%), fine, wet subrounded, sand; (55%) course, hard, subrounded to subangular, gravel (quartz, possible green sandstone fragment); (15%) fines (clay & silt); poorly sorted | T.D. 12' |

(T.D. of boring: 15')

Location Map

MW16-002

Building
# 422

**Versar** INC.
2010 CABOT BLVD
LANGHORNE, PA 19047
(215) 741-4211

## TEST HOLE/WELL LOG

Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW16-002 | Project: Pedricktown ESI | | |
| Date: 6.4.93 | Project Number: 2060.000 | | |
| Logged By: Bond | Drilled By: JCA | | |
| Elevation: | Detector: HnU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder | Grout: NA | |
| Casing Type: PVC | Diameter: 4" Length: 4.5' | Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 12' | Depth to Water: 2.5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | | 75 | | 0 | 1009 | S | | 20 | 4.6 / 10.9 | 0-6" Humus - DK. BR.; sandy |
| | 7.5YR 5/8 | ∇ 2.5' | 740 | | 0 | 1015 | SSB | | 22 | 4.3 / 2.2 | 10"-2' SAND - TAN-LBR.; fine-coarse gr; sub.rd.-Sub.Ang.; poorly sorted; ≥15% fines; non-cohesive; Tr. fine gravel; 1cm; subrd.; hard. |
| | 7.5YR 7/1 | | | | | | | 5 | | | |
| | | | 75 | | 0 | | GT | 10 | 12" | 5.14 / 18.21 | 2-4' - Sand w/ SILT LAYERS Tan sand; very fine - med gr; subrd.; poorly sorted BK SILT; Layers 1"-1.5" thick; non-cohesive water at 2.5' BG |
| | | | | | | | | | | | 9-11' SAND: TAN SAND AS BEFORE 3" clay LAYER - gray - Br.; cohesive. ↑ % of gravel to 10%; 2-4cm; Sub. rd; hard. ≥25% fines |
| | | | | | | | | | | | (T.D. of boring: 12') |

WELL COMPLETION

12' T.D.

Location Map

MW16-003

Building #432

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW16-003 | Project: Pedricktown ESI |
| Date: 6.9.93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |

| | | | |
|---|---|---|---|
| Elevation: | Detector: HnU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: 4.46 ~~4.5'~~ | Hole Dia: 8" Depth to Liquid: |
| Screen Type: PVC | Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 12.5' Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Staining | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | ▽ 3' | 10YR 2/1 | ≥15 | | 0.5 | 12:52 | 5 | | 20 | 8.9 / 9.1 | 0-6" HUMAS - DK.BR.; SANDY; TR. ANGULAR GRAVEL; | Se. |
| | | 7.5 YR 5/8 | | | 0 | 12:56 | SSA | | 15 | 4.5 / 4.5 | 6"-2' SAND - TAN; med-fine gr; sub.rd; poor sorted; ≥15% fines; non-cohesive; no gravel | Gr. Pa. |
| | | | | | | | | 5 | | | 2'-4' SAND - AS ABOVE | |
| | | | | | | | | | | | water At 3' | |
| SM | | | 10 | | 0 | | GT | 10 | 20 | 4.7 / 7.6 | 10-12' SAND - VERY coarse-fine gr.; sub-rd.-sub.ang; Tr. fine gravel; 1cm; sub rd; have; qtz.; poorly sorted. | 12.5' TD |

(T.D. of boring: 12.5')

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Location Map

MW20-001

Route 130

## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW20-001 | Project: Pedricktown ESI |
| Date: 6-3-93 | Project Number: 2060.000 |
| Logged By: BOND | Drilled By: JCA |
| Elevation: | Detector: HNU |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 SAND | Seal: Bentonite Powder |
| Grout: Cement/Bentonite | |
| Casing Type: PVC | Diameter: 4" Length: ~~5.6'~~ 5.73' |
| Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: 0.10 | Diameter: 4" Length: 10' |
| Total Depth: 16' | Depth to Water: 4.5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 7.5YR 5.8 | | ≥15 | | 0 | 1120 | S | | 20' | 2/2 2/1 | TAN-Br.; med-fine gr.; sub-rd; poorly sorted; sand; ≥15 Fines |
| | | | | | 0 | 1127 | SS5 A | | 15" | 1/1 1/3 | DkBr/Bl. SILT; moist; NON-cohesive ~8" thick |
| SM | | 45 △ | >20 >20 | | 0 | 1137 | SS5 B | 5 | 22" | 2/2 7/11 | Lt. G. clay; cohesive; tr fine sand ~6" thick |
| | | | | | | | | | | | Lt. G.; med-fine; poor sort. sub. rd. sand; w/ ≥20% fines grading to TAN/Br. sand At 6'8G. |
| | 7.5YR 7/1 | | | | 0 | | GT. | 10 | 24" | 12/15 14/17 | TAN/Br. sand: As ABOVE grading to |
| | | | | | | | | 14 | 24" | 11/7 13/16 | Lt. G.; med-coarse gr.; poor sort.; sub. rd.-angular; SAND w/ ~10% fine gravel; sub-rd to angular-hard; poor sort. |
| | | | | | | | | | | | Lt. G. sand as Above w/ ↑ IN Gravel % to 30% |
| | | | | | | | | | | | (T.D. of boring: 16') |

WELL COMPLETION

TD 13.6'

Location Map

Artillery Ave.

MW21-001

Route 130

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG | Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW21-001 | Project: Pedricktown ESI |
| Date: 6-2-93 | Project Number: 2060.000 |
| Logged By: M. Bond | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 Sand | Seal: Bentonite Powder |
| Grout: Cement/Bentonite | |
| Casing Type: PVC | Diameter: 4" Length: ~~X~~ 7.03 |
| Hole Dia: 8" | Depth to Liquid: |
| Screen Type: PVC Slot: .10 | Diameter: 4" Length: 10' |
| Total Depth: 17' | Depth to Water: 5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10YR 2/1 | | | | 0 | 0920 | S | | 20" | 2/2, 2/2 | Dk. Br. sandy Humus; med. sand | Gro |
| SM | 7.5 5/8 | 5' | 20 | | 0 | 0940 | SS#A | | | 2/2, 2/2 | Tan/orange color; Fine to medium gr. poor sorted; subrounded; 20% silt very fine sand; non-plastic; low dry strength; moisture. | Sea |
| | | | 20 | | 1 | 0955 | SS#B | 5' | | 3/3, 5/4 | | |
| | | | 20 | | 1 | | | | 24" | 7/8, 10/11 | | Sa |
| SM | | | 20 | | 1 | | GT | 10' | 4" | 5/6, 9/11 | as above | |
| SM | | | 15 | | 1 | | | 15' / 17' | 24" | 5/8, 4/4 | as above | TD 15' |

(T.D. of boring: 17')

| Location Map | |
|---|---|
| Garrison Rd. | Artillery Ave |
| MW22-001 | |

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG — Page 1 of 1

| | | | |
|---|---|---|---|
| Test/Well Number: MW22-001 | Project: Pedricktown ESI | | |
| Date: 6.9.93 | Project Number: 2060.000 | | |
| Logged By: Bcrd | Drilled By: JCA | | |
| Elevation: | Detector: HNU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: #1 sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: 4.63 ~~4.5~~ | Hole Dia: ~~6~~ 8 / Depth to Liquid: |
| Screen Type: PVC | Slot: 0.10 | Diameter: 4" Length: 10' | Total Depth: 13' / Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample ~~Staining~~ Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 5/8 | | ≥15 | | 0 | 0825 | S | | 18 | 3.4 / 3.3 | 0-6" - ~~humus~~ - DK.BR.; sandy |
| | 7.5YR 5/8 | ▽ 3' | | | 0 | 0835 | SSA | | 20 | 2.1 / 2.2 | 6"-2' SAND TAN-LBR.; Very fine-med gr.; subrd.-sub Ang.; ≥15% fines; non-cohesive; Trace coars-very coarse sand |
| | | | | | | | | 5 | | | |
| SM | | | ≥15 | | 0 | | GT | 10 | 12 | 10.12 / 18.20 | 2-4' SAND - AS ABOVE with ↑ COARSE SAND content water at 3' BG. |
| SW | | | 5 | | 0 | | | | | | |
| | | | | | | | | | | | 9-11' SAND - As above w/ Tr. gravel; 1-2 cm; sub-rd; hard. |
| | | | | | | | | | | | 12-13' Sand - Very coarse-med gr; subrd-subang; 30% gravel 3-4 cm.; sub-rd; hard; qtz. |

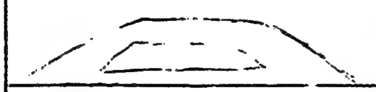
WELL COMPLETION: 13; 12.5' T.D.

(GT)

(T.D. of boring: 13')

Location Map

⊙ SB11-001



West Road

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG



| | |
|---|---|
| Test/Well Number: SB11-001 | Project: Pedricktown EST |
| Date: 6-7-93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |

| | | | | | |
|---|---|---|---|---|---|
| Elevation: | Detector: HnU | Drilling Method: HSA | | Sampling Method: SS | |
| Gravel Pack: | | Seal: | | Grout: Cement/Bentonite | |
| Casing Type: | | Diameter: | Length: | Hole Dia: 4" | Depth to Liquid: |
| Screen Type: | Slot: | Diameter: | Length: | Total Depth: 4' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | | ≥15 | | 0 | 0930 | 5 | 2 | 18" | 5/14 1/4/13 | 0-6" BK. HUMAS, SANDY<br>6"-2' BK. TO DK. BR.; fine-med gr. poor sorted; sub-round - sub-angular; trace Gravel. moist. ≥15% fines | |
| | ▽ 3' | 7.5 YR 5/8 | 20 | | 0 | 0940 | SS A GT | 4 | 20" | 5/5 4/6 | 2'-4' Tan; fine-med gr.; poorly sorted; sub.ang. - sub rd.; >20% fines; non-cohesive | |

(T.D. of boring: 4')

| Location Map | |
|---|---|
| SB10-001 | Building #471 |

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Test/Well Number: SB10-001 | Project: Pedricktown ESI |
| Date: 6·7·93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |

| | | | |
|---|---|---|---|
| Elevation: | Detector: Hnu | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: | | Seal: | Grout: Cement/Bentonite |
| Casing Type: | | Diameter: Length: | Hole Dia: 4" / Depth to Liquid: |
| Screen Type: | Slot: | Diameter: Length: | Total Depth: 4' / Depth to Water: 3' |

GT

SP-SM

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | 10YR 2/1 | | >15 | | 0 | 1044 | S | | 24 | 10 10 / 9 11 | 0-6" Humus - Dr. Br.; SANDY | |
| | 7YR 5/8 | ∇ 3' | >15 | | 0 | 1050 | SS#A GT | 4' | 24 | 4 5 / 4 4 | 6"-2' - sand; Tan/LBR.; fine-med gr.; sub.rd.-sub ang.; >15% fines; Tr. gravel - poorly sorted; non-cohesive | |
| | | | | | | | | | | | 2-4' sand - as above | |
| | | | | | | | | | | | (T.D. of boring: 4') | |

| | |
|---|---|
| Location Map: Military Vehicle Parking<br>South Ave.<br>MW24-001<br>LGW-8 | **Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211 |

**TEST HOLE/WELL LOG** Page 1 of 1

| | |
|---|---|
| Test/Well Number: MW 24-001 | Project: Pedricktown EI |
| Date: 6-9-93 | Project Number: 2060.000 |
| Logged By: E. Ashton | Drilled By: JCA |

| | | | |
|---|---|---|---|
| Elevation: | Detector: Hnu | Drilling Method: Hollow Stem Auger | Sampling Method: Splitspoon |
| Gravel Pack: #1 Sand | | Seal: Bentonite Powder | Grout: NA |
| Casing Type: PVC | | Diameter: 4" Length: 3.91 | Hole Dia: 12" / Depth to Liquid: |
| Screen Type: PVC Slot: 10 | | Diameter: 4" Length: 10' | Total Depth: 16' / Depth to Water: 2.5' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | ~~Sample Staining~~ Sample time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | 2.5YR 2.5/2 | | | | 0 | 1035 | GT | 1' | 90% | 2/3 2/2 | 0'-2' (0'-1'): Dark brown, sand, fine to medium, moist, subrounded, well sorted; (1'-2'): Light brown, sand, fine to medium, moist, subrounded, well sorted. | Solid, Seal |
| | 7.5YR 5/8 | 2.5 | | | .2 | 1040 | SS A | 3' | 70% | 2/1 1/2 | 2'-4' Same as interval (1'-2'), wet. | Gravel Pack |
| | | | | | .4 | 1055 | | 10' | 80% | 3/6 7/8 | 9'-11' Same as above, coarser grained sand present. | |
| | 5YR 6/1 | | | | 0 | 1111 | | 15' | 90% | 4/7 11/5 | 14'-16' (14'-15'): Light greyish, sand fine to medium, subrounded, wet, well sorted; few spots of semi-dark tints. | T.D. 12' |
| SW | 7.5YR 5/8 | | | | | | | 16' | | | (15'-16') Light orangish brown, sand with gravel; (96%) fine to medium, wet, subrounded sand; (4%) coarse, subangular to subrounded, hard, gravel (quartz); poor sorted | |

(T.D. of boring: 16')

Location Map

SB11-002

West Road

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

TEST HOLE/WELL LOG — Page 1 of 1

| | |
|---|---|
| Test/Well Number: SB11-002 | Project: Pedricktown ESI |
| Date: 6-7-93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: | Seal: |
| Grout: Cement/Bentonite | |
| Casing Type: | Diameter: Length: |
| Hole Dia: 4" | Depth to Liquid: |
| Screen Type: Slot: | Diameter: Length: |
| Total Depth: 4' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM | | 10YR 2/1 | >15 | | .5 | 0955 | S | | 20" | 4/8 | 0-.5' BK. Humas; sandy | |
| | | | | | | | | 2 | | 4/8 | .5-2' BK. To Dr. Br.; fine-med. gr.; poor sorted; sub rd. - Sub. Ang.; ≥15% fines; Trace gravel; Non-cohesive | |
| | 3.0 | 7.5 YR 5/8 | 20 | | 0 | 1000 | SS°A G1 | | 20" | 5/5 | | |
| | | | | | | | | 4 | | 2/4 | 2-4' Tan + Lt. Br.; fine-med gR.; poorly sorted; sub. rd. - Sub-Ang; >20% fines; non-cohesive | |

(T.D. of boring: 4')

G1 SP SM

**Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211

## TEST HOLE/WELL LOG

Page 1 of 1

| | |
|---|---|
| Location Map: Building #494; SB11-003 | |
| Test/Well Number: SB11-003 | Project: Pedricktown ESI |
| Date: 6-7-93 | Project Number: 2060.000 |
| Logged By: Bond | Drilled By: JCA |
| Elevation: | Detector: HNu |
| Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: | Seal: |
| Grout: Cement/Bentonite | |
| Casing Type: | Diameter: / Length: |
| Hole Dia: 4" | Depth to Liquid: |
| Screen Type: / Slot: | Diameter: / Length: |
| Total Depth: 4' | Depth to Water: 3' |

| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | ~~Blow~~ Sample Time | Sample # | Depth | Sample Recovery | Penetration Resistence | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10YR 2/1 | | ≥15 | | 0 | 1030 | S | | 20 | 7/8, 6/7 | 0-.5' BK. Humas; SANDY | |
| SM | ▽ 3' | | | | | | | 2 | | | .5-2' TAN.-Lt. Br.; fine-coarse gr; poorly sorted; sub. rd.-sub. Ang; ≥15% fines; Tr. gravel; non-cohesive; moist | |
| | 7.5 YR 5/8 | | ≥15 | | 0 | 1033 | SS#A GT | 4 | 24 | 3/3, 3/3 | | |
| | | | | | | | | | | | 2-4' AS Above | |
| | | | | | | | | | | | (T.D. of boring: 4') | |

| Location Map | **Versar INC.** 2010 CABOT BLVD LANGHORNE, PA 19047 (215) 741-4211 |
|---|---|

Delaware Road

⊙ SB16-001

Building #404

| TEST HOLE/WELL LOG | | Page 1 of 1 | |
|---|---|---|---|
| Test/Well Number: SB16-001 | | Project: Pedricktown ESI | |
| Date: 6-2-93 | | Project Number: 2060.000 | |
| Logged By: Bond | | Drilled By: JCA | |
| Elevation: | Detector: HNU | Drilling Method: HSA | Sampling Method: SS |
| Gravel Pack: | | Seal: | Grout: Cement / Bentonite |
| Casing Type: | | Diameter: Length: | Hole Dia: / Depth to Liquid: |
| Screen Type: | Slot: | Diameter: Length: | Total Depth: 4.5' / Depth to Water: 3.5' |

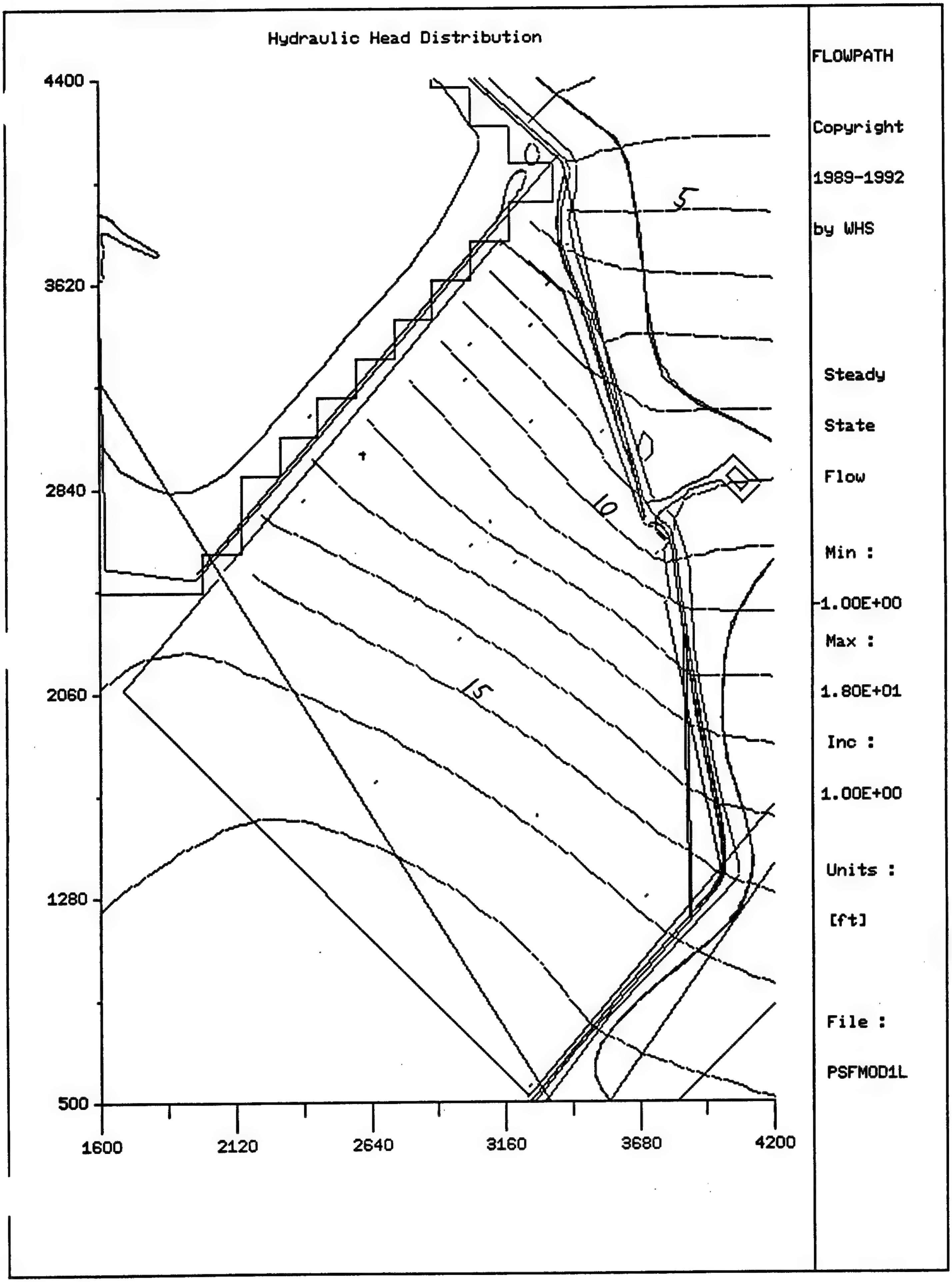
| USCS Classification | Color | Moisture Content | % Fines | Structure | Vapor (PID) | ~~Sample Interval~~ Sample time | Sample # | Depth | Sample Recovery | Penetration Resistance | LITHOLOGY/REMARKS | WELL COMPLETION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 3/4 | 6" Black top + Sub-Base | |
| | 7.5 | | 15 | | | | S | | | 5/4 | | |
| SM | 5/2 | ∇ 3.5' | | | 2 | | SS#A | 2.0 | 18 | 3/3 | TAN/BROWN; Fine to med gr; poor sorted; sub-rd sand w/ ~ 15% Fines | |
| | | | | | 3 | | GT | 4.5 | 24 | 4/2 | Trace gravel; sub-rd; hard. Non-plastic; low dry strength; moist | |
| | | | | | | | | | | | (T.D. of boring: 4.5') | |

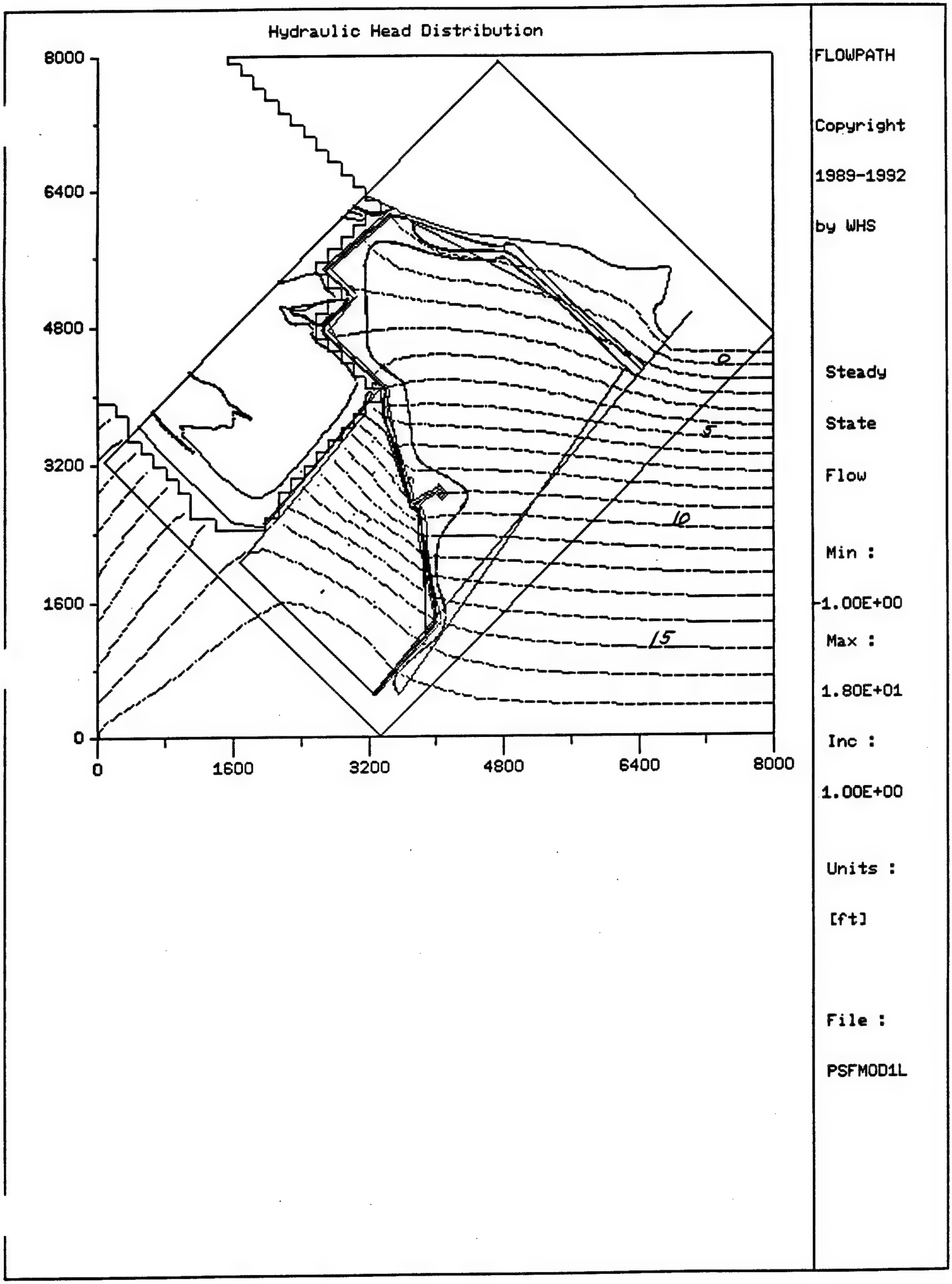
GT

SP/SM

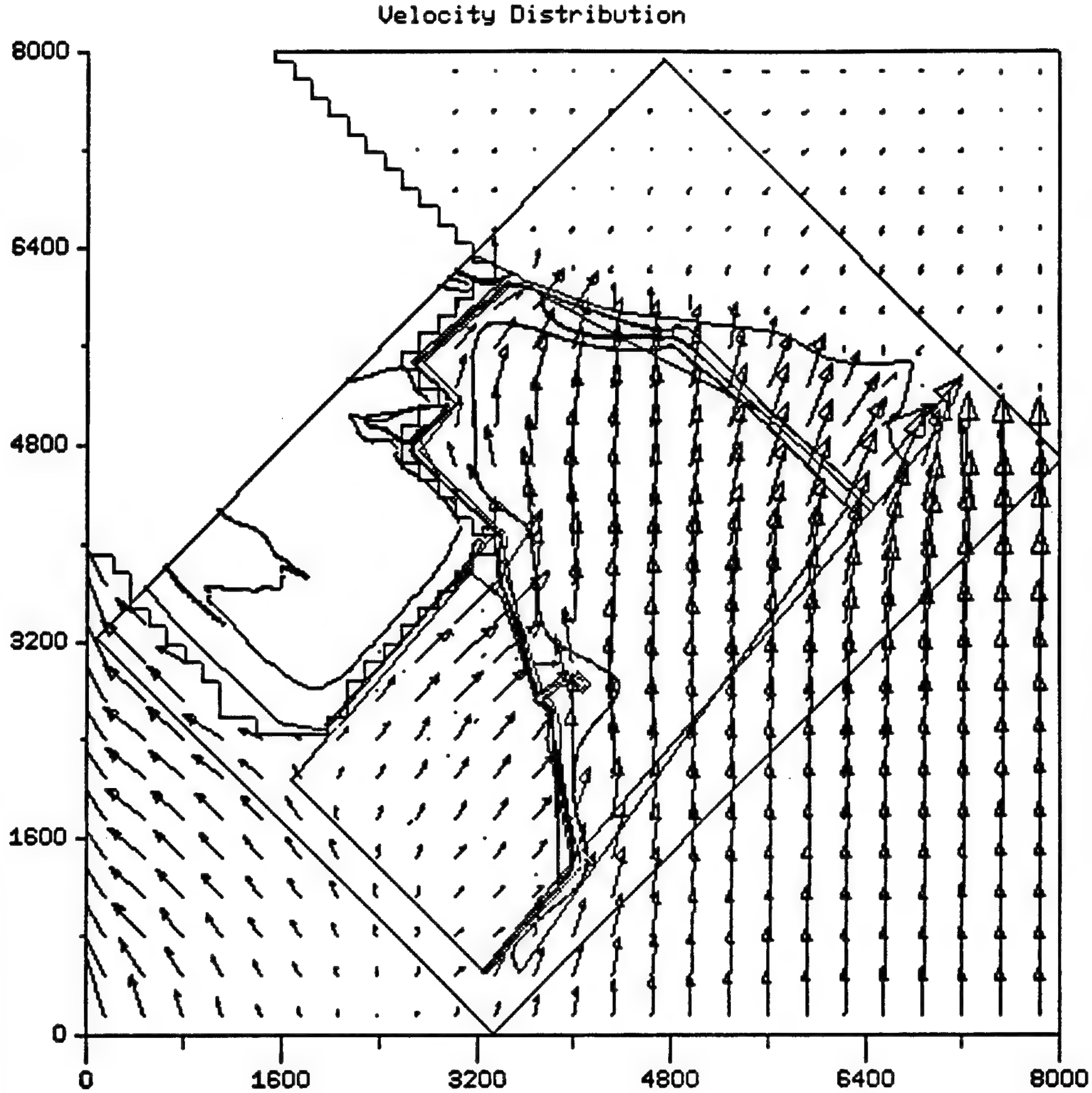
# GROUND WATER MODELING DATA

PSFMOD1L


Hydraulic Head Distribution
4400
3620
2840
2060
1280
500
1600
2120
2640
3160
3680
4200
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
-1.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD1L



Hydraulic Head Distribution
8000
6400
4800
3200
1600
0
0
1600
3200
4800
6400
8000
0
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
1.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD1L




FLOWPATH

Copyright

1989-1992

by WHS

# Wells:

0

Vmin :

0.00E+00

Vmax :

7.10E-01

Vavg :

1.79E-01

Angle:

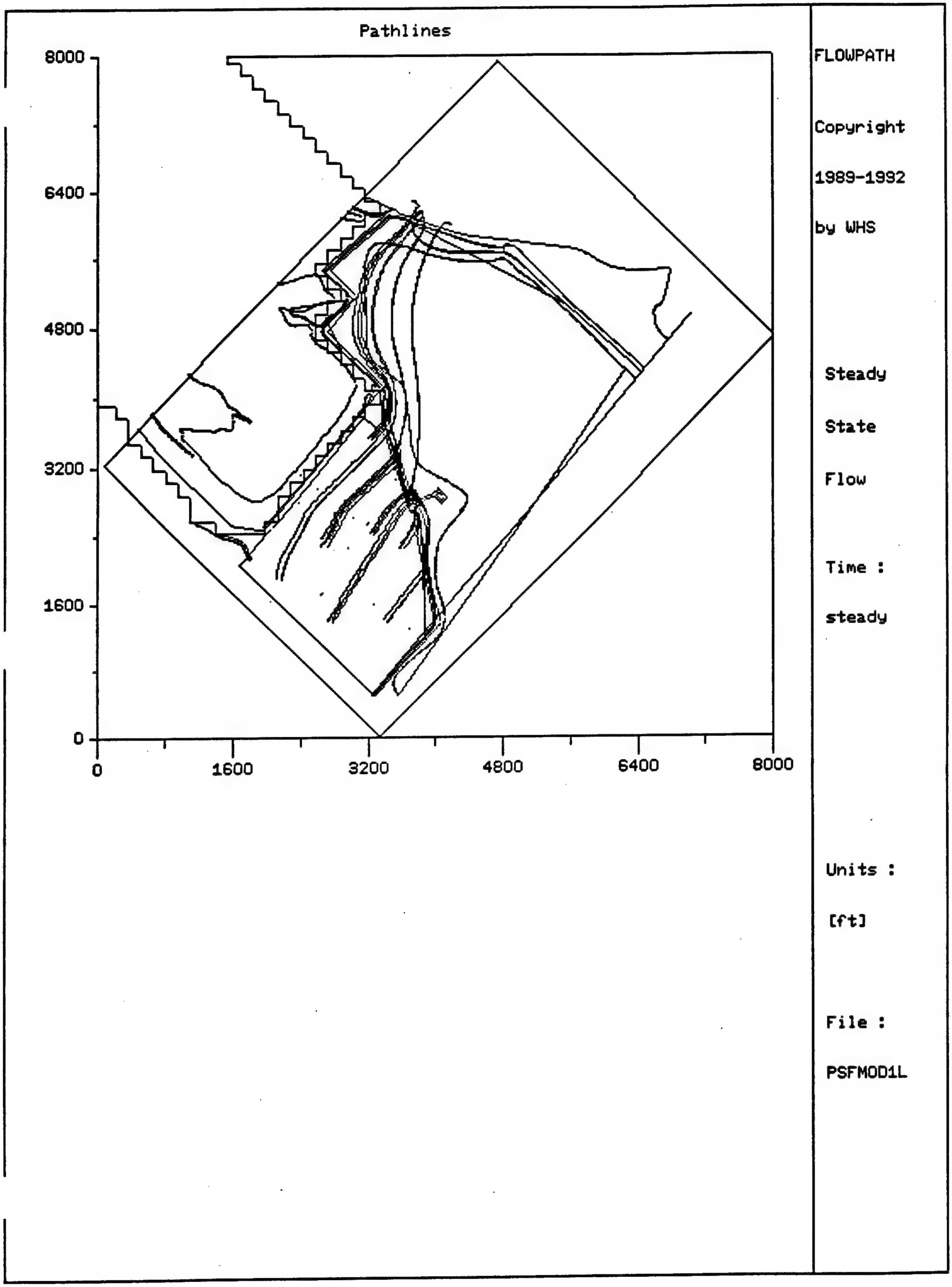
8.77E+01

Units :

[ft]

File :

PSFMOD1L



Pathlines
8000
6400
4800
3200
1600
0
0
1600
3200
4800
6400
8000
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Time :
steady
Units :
[ft]
File :
PSFMOD1L

^[S^A
^[C(

```
************************************************************
*                    E C H O P R I N T                     *
*                                                          *
*                     F L O W P A T H                      *
*                      version 3.0                         *
*                                                          *
*  FLOWPATH was written by Thomas Franz and Nilson Guiguer *
*                                                          *
************************************************************
*                                                          *
*                  Copyright 1989, 1992                    *
*                           by                             *
*              Waterloo Hydrogeologic Software             *
*                 200 Candlewood Crescent                  *
*                    Waterloo, Ontario                     *
*                    N2L 5Y9, Canada                       *
*                                                          *
*                    ph (519) 746-1798                     *
*                                                          *
************************************************************
```

FLOWPATH logbook for data set : PSFMOD1L

Unit System : English units [ft/gal/d]

***** GRID PARAMETERS *****

Number of x-grid lines : 59

Number of y-grid lines : 55

Grid coordinates (x-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 1.48148E+02 |
| 3 | 2.96296E+02 |
| 4 | 4.44444E+02 |
| 5 | 5.92593E+02 |
| 6 | 7.40741E+02 |
| 7 | 8.88889E+02 |
| 8 | 1.03704E+03 |
| 9 | 1.18519E+03 |
| 10 | 1.33333E+03 |
| 11 | 1.48148E+03 |
| 12 | 1.62963E+03 |
| 13 | 1.77778E+03 |
| 14 | 1.92593E+03 |
| 15 | 2.07407E+03 |

| | |
|---|---|
| 16 | 2.22222E+03 |
| 17 | 2.37037E+03 |
| 18 | 2.51852E+03 |
| 19 | 2.66667E+03 |
| 20 | 2.81481E+03 |
| 21 | 2.96296E+03 |
| 22 | 3.11111E+03 |
| 23 | 3.25926E+03 |
| 24 | 3.30973E+03 |
| 25 | 3.40741E+03 |
| 26 | 3.55556E+03 |
| 27 | 3.62832E+03 |
| 28 | 3.70370E+03 |
| 29 | 3.78761E+03 |
| 30 | 3.85185E+03 |
| 31 | 3.89381E+03 |
| 32 | 4.00000E+03 |
| 33 | 4.14815E+03 |
| 34 | 4.29630E+03 |
| 35 | 4.44444E+03 |
| 36 | 4.59259E+03 |
| 37 | 4.74074E+03 |
| 38 | 4.88889E+03 |
| 39 | 5.03704E+03 |
| 40 | 5.18519E+03 |
| 41 | 5.33333E+03 |
| 42 | 5.48148E+03 |
| 43 | 5.62963E+03 |
| 44 | 5.77778E+03 |
| 45 | 5.92593E+03 |
| 46 | 6.07407E+03 |
| 47 | 6.22222E+03 |
| 48 | 6.37037E+03 |
| 49 | 6.51852E+03 |
| 50 | 6.66667E+03 |
| 51 | 6.81481E+03 |
| 52 | 6.96296E+03 |
| 53 | 7.11111E+03 |
| 54 | 7.25926E+03 |
| 55 | 7.40741E+03 |
| 56 | 7.55556E+03 |
| 57 | 7.70370E+03 |
| 58 | 7.85185E+03 |
| 59 | 8.00000E+03 |

Grid coordinates (y-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 1.48148E+02 |
| 3 | 2.96296E+02 |
| 4 | 4.44444E+02 |
| 5 | 5.92593E+02 |
| 6 | 7.40741E+02 |
| 7 | 8.88889E+02 |
| 8 | 1.03704E+03 |
| 9 | 1.18519E+03 |
| 10 | 1.33333E+03 |

| | |
|---|---|
| 11 | 1.48148E+03 |
| 12 | 1.62963E+03 |
| 13 | 1.77778E+03 |
| 14 | 1.92593E+03 |
| 15 | 2.07407E+03 |
| 16 | 2.22222E+03 |
| 17 | 2.37037E+03 |
| 18 | 2.51852E+03 |
| 19 | 2.66667E+03 |
| 20 | 2.81481E+03 |
| 21 | 2.96296E+03 |
| 22 | 3.11111E+03 |
| 23 | 3.25926E+03 |
| 24 | 3.40741E+03 |
| 25 | 3.55556E+03 |
| 26 | 3.70370E+03 |
| 27 | 3.85185E+03 |
| 28 | 4.00000E+03 |
| 29 | 4.14815E+03 |
| 30 | 4.29630E+03 |
| 31 | 4.44444E+03 |
| 32 | 4.59259E+03 |
| 33 | 4.74074E+03 |
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| 38 | 5.48148E+03 |
| 39 | 5.62963E+03 |
| 40 | 5.77778E+03 |
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| 42 | 6.07407E+03 |
| 43 | 6.22222E+03 |
| 44 | 6.37037E+03 |
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| 48 | 6.96296E+03 |
| 49 | 7.11111E+03 |
| 50 | 7.25926E+03 |
| 51 | 7.40741E+03 |
| 52 | 7.55556E+03 |
| 53 | 7.70370E+03 |
| 54 | 7.85185E+03 |
| 55 | 8.00000E+03 |

***** WELL PARAMETERS *****

Number of wells : 0

***** CONSTRAINED HEAD NODES *****

Number of constant head nodes : 111

| No. | i | j | X [ft] | Y [ft] | const. head [ft] |
|---|---|---|---|---|---|
| 1 | 12 | 55 | 1.62832E+03 | 8.00000E+03 | -1.88000E+00 |
| 2 | 13 | 54 | 1.76991E+03 | 7.85841E+03 | -1.88000E+00 |
| 3 | 14 | 53 | 1.92920E+03 | 7.69912E+03 | -1.88000E+00 |
| 4 | 15 | 52 | 2.07080E+03 | 7.55752E+03 | -1.88000E+00 |
| 5 | 16 | 51 | 2.23009E+03 | 7.41593E+03 | -1.88000E+00 |
| 6 | 17 | 50 | 2.37168E+03 | 7.25664E+03 | -1.88000E+00 |
| 7 | 18 | 49 | 2.51327E+03 | 7.11504E+03 | -1.88000E+00 |
| 8 | 19 | 48 | 2.67257E+03 | 6.95575E+03 | -1.88000E+00 |
| 9 | 20 | 47 | 2.81416E+03 | 6.81416E+03 | -1.88000E+00 |
| 10 | 21 | 46 | 2.95575E+03 | 6.67257E+03 | -1.88000E+00 |
| 11 | 33 | 41 | 4.14159E+03 | 5.92920E+03 | -1.88000E+00 |
| 12 | 52 | 32 | 6.95575E+03 | 4.58407E+03 | -1.88000E+00 |
| 13 | 49 | 38 | 6.51327E+03 | 5.48673E+03 | -1.88000E+00 |
| 14 | 28 | 43 | 3.69912E+03 | 6.23009E+03 | -1.88000E+00 |
| 15 | 51 | 36 | 6.81416E+03 | 5.18584E+03 | -1.88000E+00 |
| 16 | 43 | 40 | 5.62832E+03 | 5.76991E+03 | -1.88000E+00 |
| 17 | 40 | 40 | 5.18584E+03 | 5.76991E+03 | -1.88000E+00 |
| 18 | 40 | 41 | 5.18584E+03 | 5.92920E+03 | -1.88000E+00 |
| 19 | 23 | 45 | 3.25664E+03 | 6.51327E+03 | -1.88000E+00 |
| 20 | 47 | 38 | 6.23009E+03 | 5.48673E+03 | -1.88000E+00 |
| 21 | 30 | 42 | 3.85841E+03 | 6.07080E+03 | -1.88000E+00 |
| 22 | 41 | 40 | 5.32743E+03 | 5.76991E+03 | -1.88000E+00 |
| 23 | 51 | 38 | 6.81416E+03 | 5.48673E+03 | -1.88000E+00 |
| 24 | 50 | 35 | 6.67257E+03 | 5.04425E+03 | -1.88000E+00 |
| 25 | 50 | 34 | 6.67257E+03 | 4.88496E+03 | -1.88000E+00 |
| 26 | 50 | 38 | 6.67257E+03 | 5.48673E+03 | -1.88000E+00 |
| 27 | 35 | 41 | 4.44248E+03 | 5.92920E+03 | -1.88000E+00 |
| 28 | 46 | 38 | 6.07080E+03 | 5.48673E+03 | -1.88000E+00 |
| 29 | 25 | 43 | 3.41593E+03 | 6.23009E+03 | -1.88000E+00 |
| 30 | 39 | 41 | 5.04425E+03 | 5.92920E+03 | -1.88000E+00 |
| 31 | 34 | 41 | 4.30088E+03 | 5.92920E+03 | -1.88000E+00 |
| 32 | 44 | 40 | 5.76991E+03 | 5.76991E+03 | -1.88000E+00 |
| 33 | 42 | 40 | 5.48673E+03 | 5.76991E+03 | -1.88000E+00 |
| 34 | 37 | 41 | 4.74336E+03 | 5.92920E+03 | -1.88000E+00 |
| 35 | 51 | 37 | 6.81416E+03 | 5.32743E+03 | -1.88000E+00 |
| 36 | 45 | 39 | 5.92920E+03 | 5.62832E+03 | -1.88000E+00 |
| 37 | 25 | 44 | 3.41593E+03 | 6.37168E+03 | -1.88000E+00 |
| 38 | 48 | 38 | 6.37168E+03 | 5.48673E+03 | -1.88000E+00 |
| 39 | 32 | 42 | 4.00000E+03 | 6.07080E+03 | -1.88000E+00 |
| 40 | 26 | 43 | 3.55752E+03 | 6.23009E+03 | -1.88000E+00 |
| 41 | 22 | 45 | 3.11504E+03 | 6.51327E+03 | -1.88000E+00 |
| 42 | 36 | 41 | 4.58407E+03 | 5.92920E+03 | -1.88000E+00 |
| 43 | 38 | 41 | 4.88496E+03 | 5.92920E+03 | -1.88000E+00 |
| 44 | 50 | 33 | 6.67257E+03 | 4.74336E+03 | -1.88000E+00 |
| 45 | 51 | 32 | 6.81416E+03 | 4.58407E+03 | -1.88000E+00 |
| 46 | 45 | 38 | 5.92920E+03 | 5.48673E+03 | -1.88000E+00 |
| 47 | 53 | 32 | 7.11504E+03 | 4.58407E+03 | -1.88000E+00 |
| 48 | 54 | 32 | 7.25664E+03 | 4.58407E+03 | -1.88000E+00 |
| 49 | 55 | 32 | 7.41593E+03 | 4.58407E+03 | -1.88000E+00 |
| 50 | 56 | 32 | 7.55752E+03 | 4.58407E+03 | -1.88000E+00 |
| 51 | 57 | 32 | 7.69912E+03 | 4.58407E+03 | -1.88000E+00 |
| 52 | 58 | 32 | 7.85841E+03 | 4.58407E+03 | -1.88000E+00 |
| 53 | 59 | 32 | 8.00000E+03 | 4.58407E+03 | -1.88000E+00 |

| | | | | | |
|---|---|---|---|---|---|
| 54 | 59 | 1 | 8.00000E+03 | 0.00000E+00 | 1.80000E+01 |
| 55 | 58 | 1 | 7.85841E+03 | 0.00000E+00 | 1.80000E+01 |
| 56 | 57 | 1 | 7.69912E+03 | 0.00000E+00 | 1.80000E+01 |
| 57 | 56 | 1 | 7.55752E+03 | 0.00000E+00 | 1.80000E+01 |
| 58 | 55 | 1 | 7.41593E+03 | 0.00000E+00 | 1.80000E+01 |
| 59 | 54 | 1 | 7.25664E+03 | 0.00000E+00 | 1.80000E+01 |
| 60 | 53 | 1 | 7.11504E+03 | 0.00000E+00 | 1.80000E+01 |
| 61 | 52 | 1 | 6.95575E+03 | 0.00000E+00 | 1.80000E+01 |
| 62 | 51 | 1 | 6.81416E+03 | 0.00000E+00 | 1.80000E+01 |
| 63 | 50 | 1 | 6.67257E+03 | 0.00000E+00 | 1.80000E+01 |
| 64 | 49 | 1 | 6.51327E+03 | 0.00000E+00 | 1.80000E+01 |
| 65 | 48 | 1 | 6.37168E+03 | 0.00000E+00 | 1.80000E+01 |
| 66 | 47 | 1 | 6.23009E+03 | 0.00000E+00 | 1.80000E+01 |
| 67 | 46 | 1 | 6.07080E+03 | 0.00000E+00 | 1.80000E+01 |
| 68 | 45 | 1 | 5.92920E+03 | 0.00000E+00 | 1.80000E+01 |
| 69 | 44 | 1 | 5.76991E+03 | 0.00000E+00 | 1.80000E+01 |
| 70 | 43 | 1 | 5.62832E+03 | 0.00000E+00 | 1.80000E+01 |
| 71 | 42 | 1 | 5.48673E+03 | 0.00000E+00 | 1.80000E+01 |
| 72 | 41 | 1 | 5.32743E+03 | 0.00000E+00 | 1.80000E+01 |
| 73 | 40 | 1 | 5.18584E+03 | 0.00000E+00 | 1.80000E+01 |
| 74 | 39 | 1 | 5.04425E+03 | 0.00000E+00 | 1.80000E+01 |
| 75 | 38 | 1 | 4.88496E+03 | 0.00000E+00 | 1.80000E+01 |
| 76 | 37 | 1 | 4.74336E+03 | 0.00000E+00 | 1.80000E+01 |
| 77 | 36 | 1 | 4.58407E+03 | 0.00000E+00 | 1.80000E+01 |
| 78 | 35 | 1 | 4.44248E+03 | 0.00000E+00 | 1.80000E+01 |
| 79 | 34 | 1 | 4.30088E+03 | 0.00000E+00 | 1.80000E+01 |
| 80 | 33 | 1 | 4.14159E+03 | 0.00000E+00 | 1.80000E+01 |
| 81 | 32 | 1 | 4.00000E+03 | 0.00000E+00 | 1.80000E+01 |
| 82 | 31 | 1 | 3.89381E+03 | 0.00000E+00 | 1.80000E+01 |
| 83 | 30 | 1 | 3.85841E+03 | 0.00000E+00 | 1.80000E+01 |
| 84 | 29 | 1 | 3.78761E+03 | 0.00000E+00 | 1.80000E+01 |
| 85 | 28 | 1 | 3.69912E+03 | 0.00000E+00 | 1.80000E+01 |
| 86 | 27 | 1 | 3.62832E+03 | 0.00000E+00 | 1.80000E+01 |
| 87 | 26 | 1 | 3.55752E+03 | 0.00000E+00 | 1.80000E+01 |
| 88 | 25 | 1 | 3.41593E+03 | 0.00000E+00 | 1.80000E+01 |
| 89 | 24 | 1 | 3.30973E+03 | 0.00000E+00 | 1.80000E+01 |
| 90 | 23 | 1 | 3.25664E+03 | 0.00000E+00 | 1.80000E+01 |
| 91 | 22 | 1 | 3.11504E+03 | 0.00000E+00 | 1.80000E+01 |
| 92 | 21 | 1 | 2.95575E+03 | 0.00000E+00 | 1.80000E+01 |
| 93 | 20 | 1 | 2.81416E+03 | 0.00000E+00 | 1.80000E+01 |
| 94 | 19 | 1 | 2.67257E+03 | 0.00000E+00 | 1.80000E+01 |
| 95 | 18 | 1 | 2.51327E+03 | 0.00000E+00 | 1.80000E+01 |
| 96 | 17 | 1 | 2.37168E+03 | 0.00000E+00 | 1.80000E+01 |
| 97 | 16 | 1 | 2.23009E+03 | 0.00000E+00 | 1.80000E+01 |
| 98 | 15 | 1 | 2.07080E+03 | 0.00000E+00 | 1.80000E+01 |
| 99 | 14 | 1 | 1.92920E+03 | 0.00000E+00 | 1.80000E+01 |
| 100 | 13 | 1 | 1.76991E+03 | 0.00000E+00 | 1.80000E+01 |
| 101 | 12 | 1 | 1.62832E+03 | 0.00000E+00 | 1.80000E+01 |
| 102 | 11 | 1 | 1.48673E+03 | 0.00000E+00 | 1.80000E+01 |
| 103 | 10 | 1 | 1.32743E+03 | 0.00000E+00 | 1.80000E+01 |
| 104 | 9 | 1 | 1.18584E+03 | 0.00000E+00 | 1.80000E+01 |
| 105 | 8 | 1 | 1.04425E+03 | 0.00000E+00 | 1.80000E+01 |
| 106 | 7 | 1 | 8.84956E+02 | 0.00000E+00 | 1.80000E+01 |
| 107 | 6 | 1 | 7.43363E+02 | 0.00000E+00 | 1.80000E+01 |
| 108 | 5 | 1 | 5.84071E+02 | 0.00000E+00 | 1.80000E+01 |
| 109 | 4 | 1 | 4.42478E+02 | 0.00000E+00 | 1.80000E+01 |
| 110 | 3 | 1 | 3.00885E+02 | 0.00000E+00 | 1.80000E+01 |
| 111 | 2 | 1 | 1.41593E+02 | 0.00000E+00 | 1.80000E+01 |

***** SPECIFIED FLUX NODES *****

Number of flux nodes : 57

| No. | i | j | X [ft] | Y [ft] | nodal flow [ft^3/ft^2/d] |
|---|---|---|---|---|---|
| 1 | 59 | 31 | 8.00000E+03 | 4.44248E+03 | 0.00000E+00 |
| 2 | 59 | 30 | 8.00000E+03 | 4.30088E+03 | 0.00000E+00 |
| 3 | 59 | 29 | 8.00000E+03 | 4.14159E+03 | 0.00000E+00 |
| 4 | 59 | 28 | 8.00000E+03 | 4.00000E+03 | 0.00000E+00 |
| 5 | 59 | 27 | 8.00000E+03 | 3.85841E+03 | 0.00000E+00 |
| 6 | 59 | 26 | 8.00000E+03 | 3.69912E+03 | 0.00000E+00 |
| 7 | 59 | 25 | 8.00000E+03 | 3.55752E+03 | 0.00000E+00 |
| 8 | 59 | 24 | 8.00000E+03 | 3.41593E+03 | 0.00000E+00 |
| 9 | 59 | 23 | 8.00000E+03 | 3.25664E+03 | 0.00000E+00 |
| 10 | 59 | 22 | 8.00000E+03 | 3.11504E+03 | 0.00000E+00 |
| 11 | 59 | 21 | 8.00000E+03 | 2.95575E+03 | 0.00000E+00 |
| 12 | 59 | 20 | 8.00000E+03 | 2.81416E+03 | 0.00000E+00 |
| 13 | 59 | 19 | 8.00000E+03 | 2.67257E+03 | 0.00000E+00 |
| 14 | 59 | 18 | 8.00000E+03 | 2.51327E+03 | 0.00000E+00 |
| 15 | 59 | 17 | 8.00000E+03 | 2.37168E+03 | 0.00000E+00 |
| 16 | 59 | 16 | 8.00000E+03 | 2.23009E+03 | 0.00000E+00 |
| 17 | 59 | 15 | 8.00000E+03 | 2.07080E+03 | 0.00000E+00 |
| 18 | 59 | 14 | 8.00000E+03 | 1.92920E+03 | 0.00000E+00 |
| 19 | 59 | 13 | 8.00000E+03 | 1.76991E+03 | 0.00000E+00 |
| 20 | 59 | 12 | 8.00000E+03 | 1.62832E+03 | 0.00000E+00 |
| 21 | 59 | 11 | 8.00000E+03 | 1.48673E+03 | 0.00000E+00 |
| 22 | 59 | 10 | 8.00000E+03 | 1.32743E+03 | 0.00000E+00 |
| 23 | 59 | 9 | 8.00000E+03 | 1.18584E+03 | 0.00000E+00 |
| 24 | 59 | 8 | 8.00000E+03 | 1.04425E+03 | 0.00000E+00 |
| 25 | 59 | 7 | 8.00000E+03 | 8.84956E+02 | 0.00000E+00 |
| 26 | 59 | 6 | 8.00000E+03 | 7.43363E+02 | 0.00000E+00 |
| 27 | 59 | 5 | 8.00000E+03 | 5.84071E+02 | 0.00000E+00 |
| 28 | 59 | 4 | 8.00000E+03 | 4.42478E+02 | 0.00000E+00 |
| 29 | 59 | 3 | 8.00000E+03 | 3.00885E+02 | 0.00000E+00 |
| 30 | 59 | 2 | 8.00000E+03 | 1.41593E+02 | 0.00000E+00 |
| 31 | 1 | 27 | 0.00000E+00 | 3.85841E+03 | -6.70000E-01 |
| 32 | 1 | 2 | 0.00000E+00 | 1.41593E+02 | -6.70000E-01 |
| 33 | 1 | 3 | 0.00000E+00 | 3.00885E+02 | -6.70000E-01 |
| 34 | 1 | 4 | 0.00000E+00 | 4.42478E+02 | -6.70000E-01 |
| 35 | 1 | 5 | 0.00000E+00 | 5.84071E+02 | -6.70000E-01 |
| 36 | 1 | 6 | 0.00000E+00 | 7.43363E+02 | -6.70000E-01 |
| 37 | 1 | 7 | 0.00000E+00 | 8.84956E+02 | -6.70000E-01 |
| 38 | 1 | 8 | 0.00000E+00 | 1.04425E+03 | -6.70000E-01 |
| 39 | 1 | 9 | 0.00000E+00 | 1.18584E+03 | -6.70000E-01 |
| 40 | 1 | 10 | 0.00000E+00 | 1.32743E+03 | -6.70000E-01 |
| 41 | 1 | 11 | 0.00000E+00 | 1.48673E+03 | -6.70000E-01 |
| 42 | 1 | 12 | 0.00000E+00 | 1.62832E+03 | -6.70000E-01 |
| 43 | 1 | 13 | 0.00000E+00 | 1.76991E+03 | -6.70000E-01 |
| 44 | 1 | 14 | 0.00000E+00 | 1.92920E+03 | -6.70000E-01 |
| 45 | 1 | 15 | 0.00000E+00 | 2.07080E+03 | -6.70000E-01 |
| 46 | 1 | 16 | 0.00000E+00 | 2.23009E+03 | -6.70000E-01 |
| 47 | 1 | 17 | 0.00000E+00 | 2.37168E+03 | -6.70000E-01 |
| 48 | 1 | 18 | 0.00000E+00 | 2.51327E+03 | -6.70000E-01 |

| | | | | | |
|---|---|---|---|---|---|
| 49 | 1 | 19 | 0.00000E+00 | 2.67257E+03 | -6.70000E-01 |
| 50 | 1 | 20 | 0.00000E+00 | 2.81416E+03 | -6.70000E-01 |
| 51 | 1 | 21 | 0.00000E+00 | 2.95575E+03 | -6.70000E-01 |
| 52 | 1 | 22 | 0.00000E+00 | 3.11504E+03 | -6.70000E-01 |
| 53 | 1 | 23 | 0.00000E+00 | 3.25664E+03 | -6.70000E-01 |
| 54 | 1 | 24 | 0.00000E+00 | 3.41593E+03 | -6.70000E-01 |
| 55 | 1 | 25 | 0.00000E+00 | 3.55752E+03 | -6.70000E-01 |
| 56 | 1 | 26 | 0.00000E+00 | 3.69912E+03 | -6.70000E-01 |
| 57 | 1 | 1 | 0.00000E+00 | 0.00000E+00 | -6.70000E-01 |

***** SURFACE WATER BODIES *****

Number of surface water body nodes : 13

| No. | i | j | X [ft] | Y [ft] | water table [ft] | bottom elevation [ft] | leakage factor [ft/d] |
|---|---|---|---|---|---|---|---|
| 1 | 24 | 5 | 3.310E+03 | 5.841E+02 | 1.700E+01 | 1.600E+01 | 1.0000E-01 |
| 2 | 27 | 7 | 3.628E+03 | 8.850E+02 | 1.600E+01 | 1.500E+01 | 1.0000E-01 |
| 3 | 32 | 10 | 4.000E+03 | 1.327E+03 | 1.500E+01 | 1.400E+01 | 1.0000E-01 |
| 4 | 32 | 12 | 4.000E+03 | 1.628E+03 | 1.400E+01 | 1.300E+01 | 1.0000E-01 |
| 5 | 31 | 16 | 3.894E+03 | 2.230E+03 | 1.100E+01 | 1.000E+01 | 1.0000E-01 |
| 6 | 29 | 19 | 3.788E+03 | 2.673E+03 | 8.000E+00 | 7.000E+00 | 1.0000E-01 |
| 7 | 28 | 21 | 3.699E+03 | 2.956E+03 | 7.000E+00 | 6.000E+00 | 1.0000E-01 |
| 8 | 26 | 24 | 3.558E+03 | 3.416E+03 | 6.500E+00 | 5.500E+00 | 1.0000E-01 |
| 9 | 25 | 27 | 3.416E+03 | 3.858E+03 | 5.000E+00 | 4.000E+00 | 1.0000E-01 |
| 10 | 24 | 29 | 3.310E+03 | 4.142E+03 | 3.000E+00 | 2.000E+00 | 1.0000E-01 |
| 11 | 25 | 42 | 3.416E+03 | 6.071E+03 | 0.000E+00 | -1.000E+00 | 1.0000E-01 |
| 12 | 20 | 33 | 2.814E+03 | 4.743E+03 | 2.000E+00 | 1.000E+00 | 1.0000E-01 |
| 13 | 20 | 38 | 2.814E+03 | 5.487E+03 | 1.000E+00 | 0.000E+00 | 1.0000E-01 |

***** AQUIFER PROPERTIES *****

Number of different material properties : 3

| No. | Kxx [ft/d] | Kyy [ft/d] | Porosity [-] | |
|---|---|---|---|---|
| 1 | 3.00000E+01 | 3.00000E+01 | 3.00000E-01 | (default) |
| 2 | 2.00000E+01 | 2.00000E+01 | 3.00000E-01 | |
| 3 | 1.00000E+01 | 1.00000E+01 | 3.00000E-01 | |

********** DISTRIBUTION OF AQUIFER MATERIAL PROPERTIES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 |
| 54 | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 |
| 52 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 |
| 51 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 |
| 50 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 |
| 49 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 25 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 2 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 2 | 2 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 3 | 3 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 3 | 3 | 3 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |

| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 54 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 53 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 52 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 51 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 47 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 46 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 44 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 43 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 42 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | * | * | * | * | * | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 25 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 24 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 23 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 22 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 21 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 20 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 19 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 18 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 17 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 16 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 14 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 13 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 12 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 |
| 11 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 |
| 10 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 9 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 54 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 53 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 52 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 51 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 46 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 44 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 43 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 42 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51

| | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|---|---|---|
| 55 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 54 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 53 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 52 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 51 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 46 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 44 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 43 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 42 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|---|---|---|
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

***** AQUIFER TYPE *****

Unconfined aquifer

***** AQUIFER BOTTOM ELEVATIONS *****

Number of different aquifer bottom elevations : 3

| No. | aquifer bottom elevation [ft] |
|---|---|
| 1 | -1.00000E+01 (default) |
| 2 | -1.50000E+01 |
| 3 | -2.50000E+01 |

********** DISTRIBUTION OF AQUIFER BOTTOM ELEVATIONS **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 |
| 54 | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 |
| 53 | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 |
| 52 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 |
| 51 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 |
| 50 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 |
| 49 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 25 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| 55 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 54 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 53 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 52 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 51 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 50 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 47 | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 46 | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 44 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 43 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 42 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 41 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 39 | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 38 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 55 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 54 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 53 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 52 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 51 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 50 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 47 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 46 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 44 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 43 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 42 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 41 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 39 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 38 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 37 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
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| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|---|---|---|
| 55 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 54 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 53 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 52 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 51 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 50 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 47 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 46 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 44 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 43 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 42 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 41 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 39 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 38 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 37 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 36 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |

***** AREAL RECHARGE *****

Number of different infiltration/evapotranspiration rates : 2

| No. | infiltration [L/T] | evapotranspiration [L/T] | effective recharge [L/T] | |
|---|---|---|---|---|
| 1 | 9.00000E-04 | 0.00000E+00 | 9.00000E-04 | (default) |
| 1 | 0.00000E+00 | 0.00000E+00 | 0.00000E+00 | |

********** DISTRIBUTION OF AREAL IN/OUT-FLUXES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 |
| 54 | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 |
| 53 | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 |
| 52 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 |
| 51 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 |
| 50 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 |
| 49 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 25 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| 55 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 54 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 53 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 52 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 51 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 50 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 49 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 47 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 46 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 45 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 44 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 43 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 42 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 41 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
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| 39 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 26 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 25 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 24 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 23 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |

| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 55 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 54 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 53 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 52 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 51 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
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| 49 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 47 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 46 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 45 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 44 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 43 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 42 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 41 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 40 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 39 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 24 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 23 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 22 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 21 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 20 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 19 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 18 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 16 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 15 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 14 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 13 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 8 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|---|---|---|
| 55 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 54 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 53 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 52 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 51 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 50 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 49 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 47 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 46 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 45 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 44 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 43 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 42 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 41 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 40 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 39 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 24 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 23 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 22 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 21 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 20 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 19 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 18 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 16 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 15 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 14 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 13 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 8 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

```
5 | 2   2   2   2   2   2   2   2
4 | 2   2   2   2   2   2   2   2
3 | 2   2   2   2   2   2   2   2
2 | 2   2   2   2   2   2   2   2
1 | 2   2   2   2   2   2   2   2
----------------------------------
  | 52  53  54  55  56  57  58  59
```

***** PATHLINE & PARTICLE TRACKING DATA *****

Number of forward particles : 26

| No. | x-release | y-release |
|---|---|---|
| 1 | 2.66173E+03 | 2.38095E+03 |
| 2 | 2.73792E+03 | 2.38095E+03 |
| 3 | 2.69559E+03 | 2.33439E+03 |
| 4 | 2.64903E+03 | 2.29206E+03 |
| 5 | 2.73792E+03 | 2.29206E+03 |
| 6 | 3.26279E+03 | 3.55344E+03 |
| 7 | 3.22046E+03 | 3.54497E+03 |
| 8 | 3.25432E+03 | 3.51534E+03 |
| 9 | 1.80049E+03 | 2.14871E+03 |
| 10 | 1.83436E+03 | 2.14871E+03 |
| 11 | 1.81743E+03 | 2.12162E+03 |
| 12 | 2.79200E+03 | 1.37257E+03 |
| 13 | 2.79200E+03 | 1.41953E+03 |
| 14 | 2.73721E+03 | 1.39605E+03 |
| 15 | 3.46477E+03 | 1.42248E+03 |
| 16 | 3.40577E+03 | 1.42248E+03 |
| 17 | 3.43527E+03 | 1.37824E+03 |
| 18 | 3.58374E+03 | 2.26614E+03 |
| 19 | 3.63881E+03 | 2.26614E+03 |
| 20 | 3.60734E+03 | 2.32121E+03 |
| 21 | 3.28482E+03 | 2.43133E+03 |
| 22 | 3.28482E+03 | 2.47067E+03 |
| 23 | 3.23763E+03 | 2.44707E+03 |
| 24 | 2.18286E+03 | 1.88825E+03 |
| 25 | 2.18286E+03 | 1.94159E+03 |
| 26 | 2.12190E+03 | 1.91111E+03 |

Number of reverse particles : 0

No well particles specified

************ HYDRAULIC HEAD DISTRIBUTION ************

```
|        1        2        3        4        5        6
```

| | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| 55 | * | * | * | * | * | -1.8800E+00 |
| 54 | * | * | * | * | * | * |
| 53 | * | * | * | * | * | * |
| 52 | * | * | * | * | * | * |
| 51 | * | * | * | * | * | * |
| 50 | * | * | * | * | * | * |
| 49 | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * |
| 25 | * | * | * | * | * | * |
| 24 | * | * | * | * | * | * |
| 23 | * | * | * | * | * | * |
| 22 | * | * | * | * | * | * |
| 21 | 1.3113E+01 | * | * | * | * | * |
| 20 | 1.3419E+01 | 1.3699E+01 | * | * | * | * |
| 19 | 1.3725E+01 | 1.3953E+01 | * | * | * | * |
| 18 | 1.4069E+01 | 1.4405E+01 | 1.4860E+01 | 1.5106E+01 | * | * |
| 17 | 1.4371E+01 | 1.4699E+01 | 1.5040E+01 | 1.5328E+01 | 1.5633E+01 | 1.5811E+01 |
| 16 | 1.4641E+01 | 1.4948E+01 | 1.5242E+01 | 1.5504E+01 | 1.5734E+01 | 1.5889E+01 |
| 15 | 1.4892E+01 | 1.5180E+01 | 1.5446E+01 | 1.5683E+01 | 1.5883E+01 | 1.6026E+01 |
| 14 | 1.5132E+01 | 1.5404E+01 | 1.5652E+01 | 1.5872E+01 | 1.6062E+01 | 1.6221E+01 |
| 13 | 1.5365E+01 | 1.5624E+01 | 1.5858E+01 | 1.6066E+01 | 1.6248E+01 | 1.6405E+01 |
| 12 | 1.5593E+01 | 1.5840E+01 | 1.6062E+01 | 1.6259E+01 | 1.6433E+01 | 1.6583E+01 |
| 11 | 1.5819E+01 | 1.6054E+01 | 1.6264E+01 | 1.6451E+01 | 1.6615E+01 | 1.6757E+01 |
| 10 | 1.6043E+01 | 1.6266E+01 | 1.6464E+01 | 1.6639E+01 | 1.6792E+01 | 1.6926E+01 |
| 9 | 1.6265E+01 | 1.6475E+01 | 1.6660E+01 | 1.6823E+01 | 1.6965E+01 | 1.7088E+01 |
| 8 | 1.6488E+01 | 1.6683E+01 | 1.6853E+01 | 1.7002E+01 | 1.7131E+01 | 1.7243E+01 |
| 7 | 1.6711E+01 | 1.6888E+01 | 1.7042E+01 | 1.7175E+01 | 1.7290E+01 | 1.7389E+01 |
| 6 | 1.6934E+01 | 1.7091E+01 | 1.7226E+01 | 1.7341E+01 | 1.7441E+01 | 1.7525E+01 |
| 5 | 1.7157E+01 | 1.7290E+01 | 1.7403E+01 | 1.7499E+01 | 1.7581E+01 | 1.7651E+01 |
| 4 | 1.7379E+01 | 1.7484E+01 | 1.7573E+01 | 1.7647E+01 | 1.7710E+01 | 1.7763E+01 |
| 3 | 1.7597E+01 | 1.7670E+01 | 1.7731E+01 | 1.7782E+01 | 1.7825E+01 | 1.7861E+01 |
| 2 | 1.7807E+01 | 1.7844E+01 | 1.7875E+01 | 1.7901E+01 | 1.7923E+01 | 1.7941E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 55 | * | * | * | * | * | * |
| 54 | * | * | * | * | * | * |
| 53 | * | * | * | * | * | * |
| 52 | * | * | * | * | * | * |
| 51 | * | * | * | * | * | * |
| 50 | * | * | * | * | * | * |
| 49 | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * |
| 27 | 8.3069E+00 | 8.7396E+00 | * | * | * | * |
| 26 | 8.7220E+00 | 9.1361E+00 | 9.4968E+00 | * | * | * |
| 25 | 9.1353E+00 | 9.5363E+00 | 9.8255E+00 | * | * | * |
| 24 | 9.5800E+00 | 1.0002E+01 | 1.0400E+01 | 1.0859E+01 | * | * |
| 23 | 1.0014E+01 | 1.0445E+01 | 1.0862E+01 | 1.1284E+01 | 1.1692E+01 | * |
| 22 | 1.0423E+01 | 1.0855E+01 | 1.1272E+01 | 1.1678E+01 | 1.2068E+01 | 1.2438E+01 |
| 21 | 1.0805E+01 | 1.1236E+01 | 1.1649E+01 | 1.2046E+01 | 1.2423E+01 | 1.2779E+01 |
| 20 | 1.1164E+01 | 1.1594E+01 | 1.2004E+01 | 1.2393E+01 | 1.2761E+01 | 1.3104E+01 |
| 19 | 1.1502E+01 | 1.1932E+01 | 1.2339E+01 | 1.2724E+01 | 1.3086E+01 | 1.3423E+01 |
| 18 | 1.1824E+01 | 1.2253E+01 | 1.2658E+01 | 1.3041E+01 | 1.3401E+01 | 1.3743E+01 |
| 17 | 1.2131E+01 | 1.2559E+01 | 1.2963E+01 | 1.3343E+01 | 1.3702E+01 | 1.4043E+01 |
| 16 | 1.2426E+01 | 1.2853E+01 | 1.3255E+01 | 1.3632E+01 | 1.3987E+01 | 1.4322E+01 |
| 15 | 1.2710E+01 | 1.3137E+01 | 1.3536E+01 | 1.3909E+01 | 1.4258E+01 | 1.4585E+01 |
| 14 | 1.2985E+01 | 1.3411E+01 | 1.3808E+01 | 1.4177E+01 | 1.4519E+01 | 1.4837E+01 |
| 13 | 1.3255E+01 | 1.3680E+01 | 1.4074E+01 | 1.4437E+01 | 1.4772E+01 | 1.5081E+01 |
| 12 | 1.3522E+01 | 1.3945E+01 | 1.4336E+01 | 1.4694E+01 | 1.5021E+01 | 1.5321E+01 |
| 11 | 1.3787E+01 | 1.4210E+01 | 1.4596E+01 | 1.4948E+01 | 1.5268E+01 | 1.5557E+01 |
| 10 | 1.4054E+01 | 1.4476E+01 | 1.4858E+01 | 1.5203E+01 | 1.5514E+01 | 1.5793E+01 |
| 9 | 1.4327E+01 | 1.4747E+01 | 1.5124E+01 | 1.5461E+01 | 1.5761E+01 | 1.6029E+01 |
| 8 | 1.4608E+01 | 1.5026E+01 | 1.5397E+01 | 1.5725E+01 | 1.6013E+01 | 1.6266E+01 |
| 7 | 1.4903E+01 | 1.5318E+01 | 1.5681E+01 | 1.5997E+01 | 1.6270E+01 | 1.6506E+01 |
| 6 | 1.5215E+01 | 1.5627E+01 | 1.5980E+01 | 1.6281E+01 | 1.6535E+01 | 1.6750E+01 |
| 5 | 1.5552E+01 | 1.5961E+01 | 1.6301E+01 | 1.6580E+01 | 1.6810E+01 | 1.6999E+01 |
| 4 | 1.5921E+01 | 1.6328E+01 | 1.6650E+01 | 1.6900E+01 | 1.7096E+01 | 1.7252E+01 |
| 3 | 1.6323E+01 | 1.6744E+01 | 1.7039E+01 | 1.7244E+01 | 1.7393E+01 | 1.7507E+01 |
| 2 | 1.6730E+01 | 1.7251E+01 | 1.7484E+01 | 1.7614E+01 | 1.7699E+01 | 1.7760E+01 |
| 1 | 1.6939E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| | 13 | 14 | 15 | 16 | 17 | 18 |
| 55 | -1.8788E+00 | -1.8751E+00 | -1.8690E+00 | -1.8604E+00 | -1.8496E+00 | -1.8366E+00 |
| 54 | -1.8800E+00 | -1.8764E+00 | -1.8703E+00 | -1.8619E+00 | -1.8512E+00 | -1.8384E+00 |
| 53 | * | -1.8800E+00 | -1.8740E+00 | -1.8656E+00 | -1.8550E+00 | -1.8422E+00 |
| 52 | * | * | -1.8800E+00 | -1.8717E+00 | -1.8611E+00 | -1.8484E+00 |
| 51 | * | * | * | -1.8800E+00 | -1.8695E+00 | -1.8569E+00 |
| 50 | * | * | * | * | -1.8800E+00 | -1.8676E+00 |
| 49 | * | * | * | * | * | -1.8800E+00 |
| 48 | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
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| 35 | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * |
| 25 | * | * | * | * | * | * |
| 24 | * | * | * | * | * | * |
| 23 | * | * | * | * | * | * |
| 22 | * | * | * | * | * | 1.2342E+01 |
| 21 | * | * | * | * | 1.3128E+01 | 1.2739E+01 |
| 20 | * | * | * | 1.3792E+01 | 1.3470E+01 | 1.3111E+01 |
| 19 | * | * | * | 1.4206E+01 | 1.3961E+01 | 1.3640E+01 |
| 18 | * | * | 1.5333E+01 | 1.4905E+01 | 1.4592E+01 | 1.4283E+01 |
| 17 | 1.5889E+01 | 1.5875E+01 | 1.5677E+01 | 1.5391E+01 | 1.5123E+01 | 1.4849E+01 |
| 16 | 1.5960E+01 | 1.5996E+01 | 1.5930E+01 | 1.5770E+01 | 1.5571E+01 | 1.5343E+01 |
| 15 | 1.6149E+01 | 1.6220E+01 | 1.6200E+01 | 1.6106E+01 | 1.5962E+01 | 1.5779E+01 |
| 14 | 1.6363E+01 | 1.6459E+01 | 1.6466E+01 | 1.6413E+01 | 1.6311E+01 | 1.6167E+01 |
| 13 | 1.6541E+01 | 1.6659E+01 | 1.6717E+01 | 1.6690E+01 | 1.6625E+01 | 1.6513E+01 |
| 12 | 1.6713E+01 | 1.6823E+01 | 1.6911E+01 | 1.6931E+01 | 1.6907E+01 | 1.6824E+01 |
| 11 | 1.6880E+01 | 1.6983E+01 | 1.7063E+01 | 1.7150E+01 | 1.7172E+01 | 1.7103E+01 |
| 10 | 1.7042E+01 | 1.7141E+01 | 1.7228E+01 | 1.7319E+01 | 1.7359E+01 | 1.7346E+01 |
| 9 | 1.7195E+01 | 1.7286E+01 | 1.7365E+01 | 1.7432E+01 | 1.7476E+01 | 1.7506E+01 |
| 8 | 1.7339E+01 | 1.7421E+01 | 1.7489E+01 | 1.7544E+01 | 1.7583E+01 | 1.7608E+01 |
| 7 | 1.7473E+01 | 1.7544E+01 | 1.7603E+01 | 1.7648E+01 | 1.7680E+01 | 1.7699E+01 |
| 6 | 1.7597E+01 | 1.7657E+01 | 1.7705E+01 | 1.7742E+01 | 1.7767E+01 | 1.7779E+01 |
| 5 | 1.7709E+01 | 1.7758E+01 | 1.7796E+01 | 1.7825E+01 | 1.7843E+01 | 1.7850E+01 |
| 4 | 1.7808E+01 | 1.7844E+01 | 1.7873E+01 | 1.7894E+01 | 1.7907E+01 | 1.7910E+01 |
| 3 | 1.7891E+01 | 1.7915E+01 | 1.7934E+01 | 1.7948E+01 | 1.7956E+01 | 1.7957E+01 |
| 2 | 1.7956E+01 | 1.7968E+01 | 1.7978E+01 | 1.7984E+01 | 1.7988E+01 | 1.7989E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|
| | 19 | 20 | 21 | 22 | 23 | 24 |
| 55 | -1.8215E+00 | -1.8045E+00 | -1.7855E+00 | -1.7646E+00 | -1.7419E+00 | -1.7340E+00 |
| 54 | -1.8235E+00 | -1.8066E+00 | -1.7880E+00 | -1.7676E+00 | -1.7460E+00 | -1.7384E+00 |
| 53 | -1.8273E+00 | -1.8106E+00 | -1.7921E+00 | -1.7719E+00 | -1.7505E+00 | -1.7430E+00 |
| 52 | -1.8337E+00 | -1.8171E+00 | -1.7989E+00 | -1.7791E+00 | -1.7581E+00 | -1.7507E+00 |
| 51 | -1.8424E+00 | -1.8260E+00 | -1.8081E+00 | -1.7887E+00 | -1.7681E+00 | -1.7609E+00 |
| 50 | -1.8532E+00 | -1.8371E+00 | -1.8195E+00 | -1.8005E+00 | -1.7806E+00 | -1.7736E+00 |
| 49 | -1.8658E+00 | -1.8500E+00 | -1.8328E+00 | -1.8145E+00 | -1.7953E+00 | -1.7885E+00 |
| 48 | -1.8800E+00 | -1.8645E+00 | -1.8478E+00 | -1.8302E+00 | -1.8119E+00 | -1.8055E+00 |
| 47 | * | -1.8800E+00 | -1.8638E+00 | -1.8473E+00 | -1.8306E+00 | -1.8245E+00 |
| 46 | * | * | -1.8800E+00 | -1.8649E+00 | -1.8520E+00 | -1.8460E+00 |
| 45 | * | * | * | -1.8800E+00 | -1.8800E+00 | -1.8702E+00 |
| 44 | * | * | * | * | -1.8784E+00 | -1.8781E+00 |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | -4.2873E-01 | -4.6424E-01 |
| 41 | * | * | * | -8.8557E-02 | -2.7385E-01 | -3.4342E-01 |
| 40 | * | * | 2.7827E-01 | 9.5394E-02 | -9.3408E-02 | -1.6264E-01 |
| 39 | * | 6.4869E-01 | 4.5987E-01 | 2.8254E-01 | 1.0560E-01 | 4.3042E-02 |
| 38 | 8.8774E-01 | 8.8774E-01 | 6.7413E-01 | 5.1847E-01 | 3.7006E-01 | 3.1847E-01 |
| 37 | * | 8.8669E-01 | 8.8564E-01 | 8.0820E-01 | 7.0745E-01 | 6.7095E-01 |
| 36 | * | * | 1.1694E+00 | 1.1151E+00 | 1.0465E+00 | 1.0220E+00 |
| 35 | * | 1.6551E+00 | 1.5016E+00 | 1.4302E+00 | 1.3832E+00 | 1.3688E+00 |
| 34 | 1.8606E+00 | 1.8074E+00 | 1.7454E+00 | 1.7155E+00 | 1.7058E+00 | 1.7044E+00 |
| 33 | 1.9137E+00 | 1.9666E+00 | 1.9540E+00 | 1.9759E+00 | 2.0147E+00 | 2.0291E+00 |
| 32 | * | 2.0466E+00 | 2.1261E+00 | 2.2158E+00 | 2.3132E+00 | 2.3466E+00 |
| 31 | * | * | 2.2860E+00 | 2.4444E+00 | 2.6051E+00 | 2.6610E+00 |
| 30 | * | * | * | 2.6665E+00 | 2.8858E+00 | 2.9672E+00 |
| 29 | * | * | * | * | 3.1305E+00 | 3.1859E+00 |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | 6.0179E+00 | 5.8045E+00 |
| 26 | * | * | * | 7.8193E+00 | 6.9999E+00 | 6.7500E+00 |
| 25 | * | * | 9.2238E+00 | 8.5497E+00 | 7.8478E+00 | 7.6169E+00 |
| 24 | * | 1.0409E+01 | 9.8257E+00 | 9.2032E+00 | 8.5436E+00 | 8.3074E+00 |
| 23 | 1.1439E+01 | 1.0929E+01 | 1.0382E+01 | 9.8009E+00 | 9.1884E+00 | 8.9752E+00 |
| 22 | 1.1894E+01 | 1.1412E+01 | 1.0896E+01 | 1.0346E+01 | 9.7625E+00 | 9.5581E+00 |
| 21 | 1.2317E+01 | 1.1863E+01 | 1.1373E+01 | 1.0846E+01 | 1.0279E+01 | 1.0075E+01 |
| 20 | 1.2715E+01 | 1.2285E+01 | 1.1818E+01 | 1.1314E+01 | 1.0768E+01 | 1.0572E+01 |
| 19 | 1.3277E+01 | 1.2878E+01 | 1.2444E+01 | 1.1973E+01 | 1.1460E+01 | 1.1274E+01 |
| 18 | 1.3952E+01 | 1.3591E+01 | 1.3196E+01 | 1.2765E+01 | 1.2295E+01 | 1.2125E+01 |
| 17 | 1.4553E+01 | 1.4228E+01 | 1.3870E+01 | 1.3477E+01 | 1.3045E+01 | 1.2890E+01 |
| 16 | 1.5086E+01 | 1.4797E+01 | 1.4475E+01 | 1.4116E+01 | 1.3719E+01 | 1.3575E+01 |
| 15 | 1.5560E+01 | 1.5306E+01 | 1.5017E+01 | 1.4691E+01 | 1.4327E+01 | 1.4193E+01 |
| 14 | 1.5983E+01 | 1.5761E+01 | 1.5503E+01 | 1.5208E+01 | 1.4875E+01 | 1.4752E+01 |
| 13 | 1.6360E+01 | 1.6167E+01 | 1.5938E+01 | 1.5671E+01 | 1.5368E+01 | 1.5256E+01 |
| 12 | 1.6696E+01 | 1.6529E+01 | 1.6324E+01 | 1.6084E+01 | 1.5809E+01 | 1.5707E+01 |
| 11 | 1.6995E+01 | 1.6849E+01 | 1.6666E+01 | 1.6448E+01 | 1.6198E+01 | 1.6105E+01 |
| 10 | 1.7255E+01 | 1.7127E+01 | 1.6964E+01 | 1.6765E+01 | 1.6534E+01 | 1.6449E+01 |
| 9 | 1.7476E+01 | 1.7367E+01 | 1.7220E+01 | 1.7036E+01 | 1.6819E+01 | 1.6738E+01 |
| 8 | 1.7619E+01 | 1.7569E+01 | 1.7437E+01 | 1.7264E+01 | 1.7054E+01 | 1.6975E+01 |
| 7 | 1.7704E+01 | 1.7695E+01 | 1.7620E+01 | 1.7455E+01 | 1.7246E+01 | 1.7167E+01 |
| 6 | 1.7779E+01 | 1.7763E+01 | 1.7729E+01 | 1.7616E+01 | 1.7394E+01 | 1.7316E+01 |
| 5 | 1.7845E+01 | 1.7824E+01 | 1.7783E+01 | 1.7709E+01 | 1.7479E+01 | 1.7278E+01 |
| 4 | 1.7903E+01 | 1.7883E+01 | 1.7846E+01 | 1.7784E+01 | 1.7690E+01 | 1.7649E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 1.7951E+01 | 1.7936E+01 | 1.7909E+01 | 1.7867E+01 | 1.7811E+01 | 1.7789E+01 |
| 2 | 1.7985E+01 | 1.7977E+01 | 1.7963E+01 | 1.7942E+01 | 1.7916E+01 | 1.7906E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|
| | 25 | 26 | 27 | 28 | 29 | 30 |
| 55 | -1.7191E+00 | -1.6951E+00 | -1.6829E+00 | -1.6704E+00 | -1.6568E+00 | -1.6466E+00 |
| 54 | -1.7235E+00 | -1.7004E+00 | -1.6888E+00 | -1.6769E+00 | -1.6638E+00 | -1.6538E+00 |
| 53 | -1.7283E+00 | -1.7054E+00 | -1.6939E+00 | -1.6821E+00 | -1.6691E+00 | -1.6592E+00 |
| 52 | -1.7363E+00 | -1.7138E+00 | -1.7026E+00 | -1.6910E+00 | -1.6782E+00 | -1.6685E+00 |
| 51 | -1.7469E+00 | -1.7249E+00 | -1.7140E+00 | -1.7027E+00 | -1.6901E+00 | -1.6806E+00 |
| 50 | -1.7599E+00 | -1.7386E+00 | -1.7279E+00 | -1.7169E+00 | -1.7048E+00 | -1.6955E+00 |
| 49 | -1.7752E+00 | -1.7546E+00 | -1.7443E+00 | -1.7336E+00 | -1.7219E+00 | -1.7130E+00 |
| 48 | -1.7927E+00 | -1.7727E+00 | -1.7627E+00 | -1.7525E+00 | -1.7411E+00 | -1.7326E+00 |
| 47 | -1.8121E+00 | -1.7925E+00 | -1.7828E+00 | -1.7729E+00 | -1.7621E+00 | -1.7540E+00 |
| 46 | -1.8335E+00 | -1.8136E+00 | -1.8041E+00 | -1.7945E+00 | -1.7842E+00 | -1.7765E+00 |
| 45 | -1.8565E+00 | -1.8352E+00 | -1.8253E+00 | -1.8162E+00 | -1.8063E+00 | -1.7993E+00 |
| 44 | -1.8800E+00 | -1.8558E+00 | -1.8425E+00 | -1.8381E+00 | -1.8270E+00 | -1.8210E+00 |
| 43 | -1.8800E+00 | -1.8800E+00 | -1.8228E+00 | -1.8800E+00 | -1.8365E+00 | -1.8381E+00 |
| 42 | -5.7316E-01 | -1.1775E+00 | -1.3509E+00 | -1.5068E+00 | -1.6853E+00 | -1.8800E+00 |
| 41 | -4.9878E-01 | -8.3654E-01 | -9.8481E-01 | -1.1274E+00 | -1.2765E+00 | -1.3827E+00 |
| 40 | -3.0589E-01 | -5.5223E-01 | -6.7029E-01 | -7.8835E-01 | -9.1332E-01 | -1.0035E+00 |
| 39 | -8.1953E-02 | -2.8149E-01 | -3.7849E-01 | -4.7683E-01 | -5.8228E-01 | -6.5930E-01 |
| 38 | 2.1673E-01 | 5.7968E-02 | -1.9463E-02 | -9.8432E-02 | -1.8384E-01 | -2.4679E-01 |
| 37 | 5.9795E-01 | 4.8381E-01 | 4.2770E-01 | 3.7002E-01 | 3.0689E-01 | 2.5972E-01 |
| 36 | 9.7337E-01 | 8.9761E-01 | 8.5984E-01 | 8.2046E-01 | 7.7651E-01 | 7.4291E-01 |
| 35 | 1.3423E+00 | 1.3021E+00 | 1.2812E+00 | 1.2586E+00 | 1.2320E+00 | 1.2107E+00 |
| 34 | 1.7030E+00 | 1.6999E+00 | 1.6959E+00 | 1.6895E+00 | 1.6796E+00 | 1.6698E+00 |
| 33 | 2.0573E+00 | 2.0952E+00 | 2.1089E+00 | 2.1191E+00 | 2.1254E+00 | 2.1266E+00 |
| 32 | 2.4102E+00 | 2.4949E+00 | 2.5274E+00 | 2.5544E+00 | 2.5765E+00 | 2.5879E+00 |
| 31 | 2.7698E+00 | 2.9095E+00 | 2.9619E+00 | 3.0051E+00 | 3.0409E+00 | 3.0608E+00 |
| 30 | 3.1509E+00 | 3.3575E+00 | 3.4282E+00 | 3.4836E+00 | 3.5282E+00 | 3.5527E+00 |
| 29 | 3.6063E+00 | 3.8749E+00 | 3.9504E+00 | 4.0047E+00 | 4.0463E+00 | 4.0688E+00 |
| 28 | 4.4703E+00 | 4.5252E+00 | 4.5493E+00 | 4.5715E+00 | 4.5930E+00 | 4.6068E+00 |
| 27 | 5.2340E+00 | 5.1618E+00 | 5.1415E+00 | 5.1325E+00 | 5.1373E+00 | 5.1525E+00 |
| 26 | 6.2913E+00 | 5.9389E+00 | 5.8503E+00 | 5.7986E+00 | 5.7741E+00 | 5.7746E+00 |
| 25 | 7.1904E+00 | 6.6725E+00 | 6.5721E+00 | 6.5135E+00 | 6.4712E+00 | 6.4474E+00 |
| 24 | 7.8224E+00 | 6.8973E+00 | 7.0316E+00 | 7.0681E+00 | 7.0609E+00 | 7.0456E+00 |
| 23 | 8.5601E+00 | 7.9667E+00 | 7.8107E+00 | 7.7013E+00 | 7.6299E+00 | 7.5979E+00 |
| 22 | 9.1568E+00 | 8.5550E+00 | 8.3010E+00 | 8.0966E+00 | 8.0479E+00 | 8.0485E+00 |
| 21 | 9.6589E+00 | 8.9455E+00 | 8.4876E+00 | 7.8395E+00 | 8.2303E+00 | 8.3905E+00 |
| 20 | 1.0175E+01 | 9.5320E+00 | 9.2204E+00 | 8.9464E+00 | 8.8506E+00 | 8.9235E+00 |
| 19 | 1.0896E+01 | 1.0262E+01 | 9.8951E+00 | 9.4316E+00 | 8.6714E+00 | 9.3102E+00 |
| 18 | 1.1782E+01 | 1.1227E+01 | 1.0946E+01 | 1.0663E+01 | 1.0404E+01 | 1.0351E+01 |
| 17 | 1.2575E+01 | 1.2068E+01 | 1.1813E+01 | 1.1549E+01 | 1.1269E+01 | 1.1079E+01 |
| 16 | 1.3282E+01 | 1.2799E+01 | 1.2542E+01 | 1.2255E+01 | 1.1898E+01 | 1.1574E+01 |
| 15 | 1.3921E+01 | 1.3469E+01 | 1.3226E+01 | 1.2956E+01 | 1.2631E+01 | 1.2359E+01 |
| 14 | 1.4502E+01 | 1.4085E+01 | 1.3864E+01 | 1.3623E+01 | 1.3345E+01 | 1.3135E+01 |
| 13 | 1.5027E+01 | 1.4645E+01 | 1.4440E+01 | 1.4212E+01 | 1.3934E+01 | 1.3693E+01 |
| 12 | 1.5499E+01 | 1.5156E+01 | 1.4974E+01 | 1.4777E+01 | 1.4544E+01 | 1.4358E+01 |
| 11 | 1.5917E+01 | 1.5610E+01 | 1.5452E+01 | 1.5284E+01 | 1.5095E+01 | 1.4951E+01 |
| 10 | 1.6276E+01 | 1.5996E+01 | 1.5856E+01 | 1.5709E+01 | 1.5545E+01 | 1.5419E+01 |
| 9 | 1.6574E+01 | 1.6308E+01 | 1.6179E+01 | 1.6051E+01 | 1.5911E+01 | 1.5808E+01 |
| 8 | 1.6811E+01 | 1.6536E+01 | 1.6400E+01 | 1.6304E+01 | 1.6207E+01 | 1.6138E+01 |
| 7 | 1.7004E+01 | 1.6688E+01 | 1.6369E+01 | 1.6498E+01 | 1.6477E+01 | 1.6440E+01 |
| 6 | 1.7203E+01 | 1.7029E+01 | 1.6955E+01 | 1.6878E+01 | 1.6813E+01 | 1.6766E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | 1.7350E+01 | 1.7264E+01 | 1.7215E+01 | 1.7163E+01 | 1.7107E+01 | 1.7065E+01 |
| 4 | 1.7577E+01 | 1.7492E+01 | 1.7453E+01 | 1.7413E+01 | 1.7369E+01 | 1.7335E+01 |
| 3 | 1.7747E+01 | 1.7689E+01 | 1.7662E+01 | 1.7634E+01 | 1.7604E+01 | 1.7581E+01 |
| 2 | 1.7886E+01 | 1.7857E+01 | 1.7844E+01 | 1.7830E+01 | 1.7814E+01 | 1.7802E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|
| | 31 | 32 | 33 | 34 | 35 | 36 |
| 55 | -1.6403E+00 | -1.6252E+00 | -1.6030E+00 | -1.5792E+00 | -1.5545E+00 | -1.5289E+00 |
| 54 | -1.6474E+00 | -1.6312E+00 | -1.6084E+00 | -1.5846E+00 | -1.5601E+00 | -1.5348E+00 |
| 53 | -1.6528E+00 | -1.6370E+00 | -1.6144E+00 | -1.5909E+00 | -1.5666E+00 | -1.5416E+00 |
| 52 | -1.6622E+00 | -1.6465E+00 | -1.6241E+00 | -1.6009E+00 | -1.5771E+00 | -1.5526E+00 |
| 51 | -1.6744E+00 | -1.6590E+00 | -1.6372E+00 | -1.6146E+00 | -1.5913E+00 | -1.5675E+00 |
| 50 | -1.6895E+00 | -1.6746E+00 | -1.6534E+00 | -1.6315E+00 | -1.6091E+00 | -1.5861E+00 |
| 49 | -1.7072E+00 | -1.6928E+00 | -1.6724E+00 | -1.6516E+00 | -1.6303E+00 | -1.6084E+00 |
| 48 | -1.7271E+00 | -1.7134E+00 | -1.6941E+00 | -1.6745E+00 | -1.6545E+00 | -1.6340E+00 |
| 47 | -1.7488E+00 | -1.7359E+00 | -1.7180E+00 | -1.7000E+00 | -1.6816E+00 | -1.6626E+00 |
| 46 | -1.7717E+00 | -1.7599E+00 | -1.7438E+00 | -1.7276E+00 | -1.7111E+00 | -1.6942E+00 |
| 45 | -1.7950E+00 | -1.7849E+00 | -1.7710E+00 | -1.7570E+00 | -1.7427E+00 | -1.7282E+00 |
| 44 | -1.8176E+00 | -1.8106E+00 | -1.7995E+00 | -1.7879E+00 | -1.7762E+00 | -1.7643E+00 |
| 43 | -1.8365E+00 | -1.8385E+00 | -1.8295E+00 | -1.8198E+00 | -1.8108E+00 | -1.8022E+00 |
| 42 | -1.8390E+00 | -1.8800E+00 | -1.8603E+00 | -1.8516E+00 | -1.8460E+00 | -1.8412E+00 |
| 41 | -1.4411E+00 | -1.5861E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 |
| 40 | -1.0596E+00 | -1.1936E+00 | -1.3684E+00 | -1.4482E+00 | -1.4941E+00 | -1.5286E+00 |
| 39 | -7.0763E-01 | -8.2256E-01 | -9.6175E-01 | -1.0574E+00 | -1.1259E+00 | -1.1824E+00 |
| 38 | -2.8655E-01 | -3.8187E-01 | -4.9933E-01 | -5.9326E-01 | -6.7004E-01 | -7.3893E-01 |
| 37 | 2.2960E-01 | 1.5599E-01 | 6.1056E-02 | -2.3626E-02 | -1.0098E-01 | -1.7614E-01 |
| 36 | 7.2105E-01 | 6.6612E-01 | 5.9097E-01 | 5.1770E-01 | 4.4472E-01 | 3.6908E-01 |
| 35 | 1.1963E+00 | 1.1582E+00 | 1.1014E+00 | 1.0402E+00 | 9.7409E-01 | 9.0134E-01 |
| 34 | 1.6624E+00 | 1.6399E+00 | 1.6001E+00 | 1.5510E+00 | 1.4927E+00 | 1.4246E+00 |
| 33 | 2.1257E+00 | 2.1177E+00 | 2.0934E+00 | 2.0554E+00 | 2.0049E+00 | 1.9421E+00 |
| 32 | 2.5929E+00 | 2.5974E+00 | 2.5862E+00 | 2.5576E+00 | 2.5139E+00 | 2.4562E+00 |
| 31 | 3.0705E+00 | 3.0845E+00 | 3.0826E+00 | 3.0606E+00 | 3.0220E+00 | 2.9687E+00 |
| 30 | 3.5648E+00 | 3.5832E+00 | 3.5853E+00 | 3.5664E+00 | 3.5307E+00 | 3.4804E+00 |
| 29 | 4.0798E+00 | 4.0959E+00 | 4.0954E+00 | 4.0753E+00 | 4.0400E+00 | 3.9915E+00 |
| 28 | 4.6135E+00 | 4.6215E+00 | 4.6114E+00 | 4.5861E+00 | 4.5490E+00 | 4.5012E+00 |
| 27 | 5.1580E+00 | 5.1579E+00 | 5.1290E+00 | 5.0956E+00 | 5.0558E+00 | 5.0084E+00 |
| 26 | 5.7722E+00 | 5.7574E+00 | 5.7127E+00 | 5.6725E+00 | 5.6313E+00 | 5.5856E+00 |
| 25 | 6.4364E+00 | 6.4084E+00 | 6.3558E+00 | 6.3140E+00 | 6.2748E+00 | 6.2331E+00 |
| 24 | 7.0367E+00 | 7.0112E+00 | 6.9642E+00 | 6.9289E+00 | 6.8964E+00 | 6.8612E+00 |
| 23 | 7.5867E+00 | 7.5692E+00 | 7.5401E+00 | 7.5199E+00 | 7.4986E+00 | 7.4721E+00 |
| 22 | 8.0552E+00 | 8.0790E+00 | 8.0892E+00 | 8.0928E+00 | 8.0862E+00 | 8.0693E+00 |
| 21 | 8.4579E+00 | 8.5656E+00 | 8.6289E+00 | 8.6581E+00 | 8.6654E+00 | 8.6569E+00 |
| 20 | 8.9877E+00 | 9.1033E+00 | 9.1868E+00 | 9.2284E+00 | 9.2427E+00 | 9.2385E+00 |
| 19 | 9.5191E+00 | 9.6802E+00 | 9.7695E+00 | 9.8090E+00 | 9.8214E+00 | 9.8162E+00 |
| 18 | 1.0341E+01 | 1.0360E+01 | 1.0384E+01 | 1.0400E+01 | 1.0401E+01 | 1.0390E+01 |
| 17 | 1.1009E+01 | 1.0991E+01 | 1.0989E+01 | 1.0988E+01 | 1.0977E+01 | 1.0958E+01 |
| 16 | 1.1417E+01 | 1.1545E+01 | 1.1576E+01 | 1.1569E+01 | 1.1547E+01 | 1.1519E+01 |
| 15 | 1.2242E+01 | 1.2221E+01 | 1.2184E+01 | 1.2148E+01 | 1.2110E+01 | 1.2070E+01 |
| 14 | 1.3009E+01 | 1.2858E+01 | 1.2776E+01 | 1.2716E+01 | 1.2661E+01 | 1.2609E+01 |
| 13 | 1.3583E+01 | 1.3404E+01 | 1.3333E+01 | 1.3263E+01 | 1.3197E+01 | 1.3135E+01 |
| 12 | 1.4233E+01 | 1.4001E+01 | 1.3875E+01 | 1.3794E+01 | 1.3716E+01 | 1.3644E+01 |
| 11 | 1.4860E+01 | 1.4659E+01 | 1.4419E+01 | 1.4311E+01 | 1.4217E+01 | 1.4136E+01 |
| 10 | 1.5316E+01 | 1.5103E+01 | 1.4934E+01 | 1.4803E+01 | 1.4697E+01 | 1.4608E+01 |
| 9 | 1.5760E+01 | 1.5587E+01 | 1.5400E+01 | 1.5260E+01 | 1.5149E+01 | 1.5058E+01 |
| 8 | 1.6093E+01 | 1.5973E+01 | 1.5812E+01 | 1.5681E+01 | 1.5574E+01 | 1.5485E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 1.6410E+01 | 1.6322E+01 | 1.6187E+01 | 1.6070E+01 | 1.5973E+01 | 1.5891E+01 |
| 6 | 1.6735E+01 | 1.6655E+01 | 1.6537E+01 | 1.6435E+01 | 1.6349E+01 | 1.6277E+01 |
| 5 | 1.7037E+01 | 1.6967E+01 | 1.6865E+01 | 1.6779E+01 | 1.6707E+01 | 1.6646E+01 |
| 4 | 1.7313E+01 | 1.7257E+01 | 1.7173E+01 | 1.7105E+01 | 1.7048E+01 | 1.7001E+01 |
| 3 | 1.7565E+01 | 1.7525E+01 | 1.7463E+01 | 1.74[illegible]4E+01 | 1.7375E+01 | 1.7343E+01 |
| 2 | 1.7794E+01 | 1.7772E+01 | 1.7737E+01 | 1.7712E+01 | 1.7691E+01 | 1.7675E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 31 | 32 | 33 | 34 | 35 | 36 |
|---|---|---|---|---|---|---|
| | 37 | 38 | 39 | 40 | 41 | 42 |
| 55 | -1.5026E+00 | -1.4756E+00 | -1.4480E+00 | -1.4200E+00 | -1.3916E+00 | -1.3629E+00 |
| 54 | -1.5089E+00 | -1.4822E+00 | -1.4550E+00 | -1.4273E+00 | -1.3993E+00 | -1.3710E+00 |
| 53 | -1.5159E+00 | -1.4896E+00 | -1.4626E+00 | -1.4352E+00 | -1.4074E+00 | -1.3794E+00 |
| 52 | -1.5273E+00 | -1.5015E+00 | -1.4750E+00 | -1.4480E+00 | -1.4206E+00 | -1.3929E+00 |
| 51 | -1.5429E+00 | -1.5177E+00 | -1.4919E+00 | -1.4655E+00 | -1.4386E+00 | -1.4114E+00 |
| 50 | -1.5624E+00 | -1.5381E+00 | -1.5131E+00 | -1.4875E+00 | -1.4613E+00 | -1.4347E+00 |
| 49 | -1.5858E+00 | -1.5625E+00 | -1.5386E+00 | -1.5139E+00 | -1.4886E+00 | -1.4627E+00 |
| 48 | -1.6128E+00 | -1.5908E+00 | -1.5681E+00 | -1.5445E+00 | -1.5202E+00 | -1.4952E+00 |
| 47 | -1.6431E+00 | -1.6228E+00 | -1.6015E+00 | -1.5793E+00 | -1.5561E+00 | -1.5321E+00 |
| 46 | -1.6766E+00 | -1.6582E+00 | -1.6387E+00 | -1.6180E+00 | -1.5961E+00 | -1.5732E+00 |
| 45 | -1.7130E+00 | -1.6969E+00 | -1.6795E+00 | -1.6606E+00 | -1.6401E+00 | -1.6183E+00 |
| 44 | -1.7520E+00 | -1.7387E+00 | -1.7239E+00 | -1.7070E+00 | -1.6878E+00 | -1.6671E+00 |
| 43 | -1.7933E+00 | -1.7835E+00 | -1.7720E+00 | -1.7576E+00 | -1.7390E+00 | -1.7193E+00 |
| 42 | -1.8365E+00 | -1.8312E+00 | -1.8244E+00 | -1.8139E+00 | -1.7930E+00 | -1.7740E+00 |
| 41 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8456E+00 | -1.8292E+00 |
| 40 | -1.5628E+00 | -1.6085E+00 | -1.6896E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 |
| 39 | -1.2386E+00 | -1.3053E+00 | -1.3934E+00 | -1.5058E+00 | -1.5701E+00 | -1.6204E+00 |
| 38 | -8.0874E-01 | -8.8730E-01 | -9.8039E-01 | -1.0865E+00 | -1.1874E+00 | -1.2970E+00 |
| 37 | -2.5476E-01 | -3.4211E-01 | -4.4234E-01 | -5.5754E-01 | -6.8993E-01 | -8.5878E-01 |
| 36 | 2.8721E-01 | 1.9543E-01 | 9.0290E-02 | -3.1619E-02 | -1.7539E-01 | -3.5227E-01 |
| 35 | 8.1981E-01 | 7.2700E-01 | 6.2023E-01 | 4.9653E-01 | 3.5228E-01 | 1.8325E-01 |
| 34 | 1.3456E+00 | 1.2542E+00 | 1.1484E+00 | 1.0261E+00 | 8.8496E-01 | 7.2286E-01 |
| 33 | 1.8669E+00 | 1.7783E+00 | 1.6753E+00 | 1.5562E+00 | 1.4194E+00 | 1.2631E+00 |
| 32 | 2.3851E+00 | 2.3003E+00 | 2.2011E+00 | 2.0863E+00 | 1.9546E+00 | 1.8044E+00 |
| 31 | 2.9016E+00 | 2.8208E+00 | 2.7259E+00 | 2.6162E+00 | 2.4904E+00 | 2.3473E+00 |
| 30 | 3.4167E+00 | 3.3399E+00 | 3.2497E+00 | 3.1455E+00 | 3.0265E+00 | 2.8914E+00 |
| 29 | 3.9306E+00 | 3.8576E+00 | 3.7722E+00 | 3.6740E+00 | 3.5621E+00 | 3.4357E+00 |
| 28 | 4.4427E+00 | 4.3735E+00 | 4.2930E+00 | 4.2008E+00 | 4.0963E+00 | 3.9789E+00 |
| 27 | 4.9523E+00 | 4.8869E+00 | 4.8114E+00 | 4.7253E+00 | 4.6283E+00 | 4.5198E+00 |
| 26 | 5.5332E+00 | 5.4728E+00 | 5.4035E+00 | 5.3249E+00 | 5.2365E+00 | 5.1383E+00 |
| 25 | 6.1861E+00 | 6.1320E+00 | 6.0700E+00 | 5.9999E+00 | 5.9213E+00 | 5.8344E+00 |
| 24 | 6.8205E+00 | 6.7730E+00 | 6.7180E+00 | 6.6556E+00 | 6.5857E+00 | 6.5087E+00 |
| 23 | 7.4386E+00 | 7.3976E+00 | 7.3492E+00 | 7.2936E+00 | 7.2314E+00 | 7.1630E+00 |
| 22 | 8.0429E+00 | 8.0080E+00 | 7.9652E+00 | 7.9156E+00 | 7.8598E+00 | 7.7986E+00 |
| 21 | 8.6363E+00 | 8.6060E+00 | 8.5678E+00 | 8.5228E+00 | 8.4722E+00 | 8.4169E+00 |
| 20 | 9.2210E+00 | 9.1935E+00 | 9.1581E+00 | 9.1165E+00 | 9.0698E+00 | 9.0191E+00 |
| 19 | 9.7984E+00 | 9.7713E+00 | 9.7371E+00 | 9.6974E+00 | 9.6534E+00 | 9.6061E+00 |
| 18 | 1.0369E+01 | 1.0340E+01 | 1.0305E+01 | 1.0266E+01 | 1.0224E+01 | 1.0179E+01 |
| 17 | 1.0931E+01 | 1.0899E+01 | 1.0862E+01 | 1.0823E+01 | 1.0781E+01 | 1.0737E+01 |
| 16 | 1.1485E+01 | 1.1448E+01 | 1.1408E+01 | 1.1367E+01 | 1.1325E+01 | 1.1283E+01 |
| 15 | 1.2028E+01 | 1.1986E+01 | 1.1943E+01 | 1.1900E+01 | 1.1857E+01 | 1.1815E+01 |
| 14 | 1.2559E+01 | 1.2511E+01 | 1.2464E+01 | 1.2419E+01 | 1.2375E+01 | 1.2333E+01 |
| 13 | 1.3077E+01 | 1.3023E+01 | 1.2973E+01 | 1.2925E+01 | 1.2881E+01 | 1.2839E+01 |
| 12 | 1.3579E+01 | 1.3521E+01 | 1.3467E+01 | 1.3418E+01 | 1.3373E+01 | 1.3332E+01 |
| 11 | 1.4065E+01 | 1.4003E+01 | 1.3947E+01 | 1.3897E+01 | 1.3853E+01 | 1.3812E+01 |
| 10 | 1.4533E+01 | 1.4468E+01 | 1.4412E+01 | 1.4363E+01 | 1.4318E+01 | 1.4279E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 1.4982E+01 | 1.4917E+01 | 1.4862E+01 | 1.4814E+01 | 1.4771E+01 | 1.4734E+01 |
| 8 | 1.5412E+01 | 1.5350E+01 | 1.5297E+01 | 1.5251E+01 | 1.5211E+01 | 1.5176E+01 |
| 7 | 1.5823E+01 | 1.5766E+01 | 1.5717E+01 | 1.5675E+01 | 1.5639E+01 | 1.5608E+01 |
| 6 | 1.6217E+01 | 1.6166E+01 | 1.6123E+01 | 1.6087E+01 | 1.6055E+01 | 1.6028E+01 |
| 5 | 1.6596E+01 | 1.6553E+01 | 1.6518E+01 | 1.6487E+01 | 1.6461E+01 | 1.6439E+01 |
| 4 | 1.6961E+01 | 1.6929E+01 | 1.6901E+01 | 1.6877E+01 | 1.6857E+01 | 1.6840E+01 |
| 3 | 1.7316E+01 | 1.7293E+01 | 1.7275E+01 | 1.7259E+01 | 1.7245E+01 | 1.7234E+01 |
| 2 | 1.7661E+01 | 1.7650E+01 | 1.7640E+01 | 1.7632E+01 | 1.7626E+01 | 1.7620E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|
| | 43 | 44 | 45 | 46 | 47 | 48 |
| 55 | -1.3342E+00 | -1.3055E+00 | -1.2772E+00 | -1.2492E+00 | -1.2220E+00 | -1.1956E+00 |
| 54 | -1.3426E+00 | -1.3143E+00 | -1.2862E+00 | -1.2586E+00 | -1.2316E+00 | -1.2055E+00 |
| 53 | -1.3512E+00 | -1.3230E+00 | -1.2951E+00 | -1.2676E+00 | -1.2407E+00 | -1.2147E+00 |
| 52 | -1.3650E+00 | -1.3372E+00 | -1.3095E+00 | -1.2821E+00 | -1.2554E+00 | -1.2294E+00 |
| 51 | -1.3839E+00 | -1.3564E+00 | -1.3290E+00 | -1.3019E+00 | -1.2753E+00 | -1.2494E+00 |
| 50 | -1.4078E+00 | -1.3807E+00 | -1.3536E+00 | -1.3268E+00 | -1.3004E+00 | -1.2746E+00 |
| 49 | -1.4364E+00 | -1.4098E+00 | -1.3831E+00 | -1.3566E+00 | -1.3304E+00 | -1.3047E+00 |
| 48 | -1.4696E+00 | -1.4436E+00 | -1.4174E+00 | -1.3912E+00 | -1.3652E+00 | -1.3396E+00 |
| 47 | -1.5073E+00 | -1.4820E+00 | -1.4562E+00 | -1.4303E+00 | -1.4045E+00 | -1.3791E+00 |
| 46 | -1.5493E+00 | -1.5246E+00 | -1.4994E+00 | -1.4738E+00 | -1.4482E+00 | -1.4229E+00 |
| 45 | -1.5953E+00 | -1.5714E+00 | -1.5467E+00 | -1.5214E+00 | -1.4960E+00 | -1.4707E+00 |
| 44 | -1.6452E+00 | -1.6221E+00 | -1.5978E+00 | -1.5727E+00 | -1.5474E+00 | -1.5223E+00 |
| 43 | -1.6988E+00 | -1.6768E+00 | -1.6526E+00 | -1.6274E+00 | -1.6021E+00 | -1.5772E+00 |
| 42 | -1.7559E+00 | -1.7357E+00 | -1.7107E+00 | -1.6846E+00 | -1.6594E+00 | -1.6351E+00 |
| 41 | -1.8167E+00 | -1.8012E+00 | -1.7719E+00 | -1.7432E+00 | -1.7180E+00 | -1.6952E+00 |
| 40 | -1.8800E+00 | -1.8800E+00 | -1.8330E+00 | -1.7999E+00 | -1.7761E+00 | -1.7569E+00 |
| 39 | -1.6603E+00 | -1.7452E+00 | -1.8800E+00 | -1.8477E+00 | -1.8308E+00 | -1.8191E+00 |
| 38 | -1.3982E+00 | -1.5621E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 |
| 37 | -1.0539E+00 | -1.2308E+00 | -1.4304E+00 | -1.5399E+00 | -1.6217E+00 | -1.6972E+00 |
| 36 | -5.7942E-01 | -7.7781E-01 | -9.7150E-01 | -1.1371E+00 | -1.2946E+00 | -1.4606E+00 |
| 35 | -1.0933E-02 | -2.1078E-01 | -4.1783E-01 | -6.3217E-01 | -8.6759E-01 | -1.1430E+00 |
| 34 | 5.3985E-01 | 3.3966E-01 | 1.1978E-01 | -1.2731E-01 | -4.1866E-01 | -7.8212E-01 |
| 33 | 1.0862E+00 | 8.8741E-01 | 6.6183E-01 | 3.9915E-01 | 7.9604E-02 | -3.3375E-01 |
| 32 | 1.6339E+00 | 1.4402E+00 | 1.2181E+00 | 9.5796E-01 | 6.4399E-01 | 2.4997E-01 |
| 31 | 2.1848E+00 | 2.0003E+00 | 1.7892E+00 | 1.5450E+00 | 1.2583E+00 | 9.1679E-01 |
| 30 | 2.7386E+00 | 2.5661E+00 | 2.3709E+00 | 2.1492E+00 | 1.8971E+00 | 1.6116E+00 |
| 29 | 3.2936E+00 | 3.1346E+00 | 2.9570E+00 | 2.7594E+00 | 2.5411E+00 | 2.3032E+00 |
| 28 | 3.8478E+00 | 3.7025E+00 | 3.5424E+00 | 3.3674E+00 | 3.1784E+00 | 2.9782E+00 |
| 27 | 4.3995E+00 | 4.2673E+00 | 4.1232E+00 | 3.9680E+00 | 3.8032E+00 | 3.6318E+00 |
| 26 | 5.0302E+00 | 4.9124E+00 | 4.7854E+00 | 4.6503E+00 | 4.5086E+00 | 4.3634E+00 |
| 25 | 5.7395E+00 | 5.6369E+00 | 5.5275E+00 | 5.4124E+00 | 5.2934E+00 | 5.1727E+00 |
| 24 | 6.4251E+00 | 6.3355E+00 | 6.2407E+00 | 6.1420E+00 | 6.0408E+00 | 5.9391E+00 |
| 23 | 7.0890E+00 | 7.0102E+00 | 6.9276E+00 | 6.8421E+00 | 6.7553E+00 | 6.6685E+00 |
| 22 | 7.7327E+00 | 7.6629E+00 | 7.5903E+00 | 7.5157E+00 | 7.4403E+00 | 7.3654E+00 |
| 21 | 8.3577E+00 | 8.2954E+00 | 8.2309E+00 | 8.1651E+00 | 8.0990E+00 | 8.0338E+00 |
| 20 | 8.9652E+00 | 8.9089E+00 | 8.8511E+00 | 8.7925E+00 | 8.7341E+00 | 8.6766E+00 |
| 19 | 9.5564E+00 | 9.5050E+00 | 9.4525E+00 | 9.3998E+00 | 9.3476E+00 | 9.2965E+00 |
| 18 | 1.0132E+01 | 1.0085E+01 | 1.0036E+01 | 9.9885E+00 | 9.9414E+00 | 9.8955E+00 |
| 17 | 1.0693E+01 | 1.0649E+01 | 1.0604E+01 | 1.0560E+01 | 1.0517E+01 | 1.0476E+01 |
| 16 | 1.1240E+01 | 1.1198E+01 | 1.1156E+01 | 1.1115E+01 | 1.1076E+01 | 1.1038E+01 |
| 15 | 1.1773E+01 | 1.1733E+01 | 1.1693E+01 | 1.1655E+01 | 1.1619E+01 | 1.1584E+01 |
| 14 | 1.2293E+01 | 1.2254E+01 | 1.2217E+01 | 1.2181E+01 | 1.2147E+01 | 1.2116E+01 |
| 13 | 1.2800E+01 | 1.2762E+01 | 1.2727E+01 | 1.2693E+01 | 1.2662E+01 | 1.2633E+01 |
| 12 | 1.3293E+01 | 1.3257E+01 | 1.3224E+01 | 1.3193E+01 | 1.3163E+01 | 1.3136E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | 1.3774E+01 | 1.3740E+01 | 1.3709E+01 | 1.3679E+01 | 1.3652E+01 | 1.3628E+01 |
| 10 | 1.4243E+01 | 1.4211E+01 | 1.4181E+01 | 1.4154E+01 | 1.4130E+01 | 1.4107E+01 |
| 9 | 1.4700E+01 | 1.4670E+01 | 1.4643E+01 | 1.4618E+01 | 1.4596E+01 | 1.4576E+01 |
| 8 | 1.5146E+01 | 1.5118E+01 | 1.5094E+01 | 1.5072E+01 | 1.5052E+01 | 1.5034E+01 |
| 7 | 1.5580E+01 | 1.5556E+01 | 1.5534E+01 | 1.5515E+01 | 1.5497E+01 | 1.5482E+01 |
| 6 | 1.6005E+01 | 1.5984E+01 | 1.5965E+01 | 1.5949E+01 | 1.5934E+01 | 1.5921E+01 |
| 5 | 1.6419E+01 | 1.6402E+01 | 1.6387E+01 | 1.6374E+01 | 1.6362E+01 | 1.6352E+01 |
| 4 | 1.6825E+01 | 1.6812E+01 | 1.6801E+01 | 1.6791E+01 | 1.6782E+01 | 1.6774E+01 |
| 3 | 1.7224E+01 | 1.7215E+01 | 1.7207E+01 | 1.7201E+01 | 1.7195E+01 | 1.7189E+01 |
| 2 | 1.7615E+01 | 1.7611E+01 | 1.7607E+01 | 1.7603E+01 | 1.7600E+01 | 1.7598E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|
| | 49 | 50 | 51 | 52 | 53 | 54 |
| 55 | -1.1703E+00 | -1.1464E+00 | -1.1240E+00 | -1.1034E+00 | -1.0848E+00 | -1.0684E+00 |
| 54 | -1.1805E+00 | -1.1568E+00 | -1.1346E+00 | -1.1142E+00 | -1.0958E+00 | -1.0796E+00 |
| 53 | -1.1897E+00 | -1.1660E+00 | -1.1439E+00 | -1.1235E+00 | -1.1050E+00 | -1.0888E+00 |
| 52 | -1.2045E+00 | -1.1808E+00 | -1.1587E+00 | -1.1382E+00 | -1.1197E+00 | -1.1034E+00 |
| 51 | -1.2246E+00 | -1.2009E+00 | -1.1787E+00 | -1.1582E+00 | -1.1396E+00 | -1.1232E+00 |
| 50 | -1.2498E+00 | -1.2261E+00 | -1.2038E+00 | -1.1831E+00 | -1.1644E+00 | -1.1478E+00 |
| 49 | -1.2799E+00 | -1.2561E+00 | -1.2337E+00 | -1.2129E+00 | -1.1939E+00 | -1.1771E+00 |
| 48 | -1.3148E+00 | -1.2909E+00 | -1.2683E+00 | -1.2472E+00 | -1.2279E+00 | -1.2108E+00 |
| 47 | -1.3542E+00 | -1.3302E+00 | -1.3073E+00 | -1.2858E+00 | -1.2661E+00 | -1.2485E+00 |
| 46 | -1.3979E+00 | -1.3737E+00 | -1.3504E+00 | -1.3284E+00 | -1.3081E+00 | -1.2898E+00 |
| 45 | -1.4457E+00 | -1.4212E+00 | -1.3975E+00 | -1.3748E+00 | -1.3536E+00 | -1.3345E+00 |
| 44 | -1.4973E+00 | -1.4726E+00 | -1.4483E+00 | -1.4246E+00 | -1.4023E+00 | -1.3819E+00 |
| 43 | -1.5525E+00 | -1.5276E+00 | -1.5026E+00 | -1.4776E+00 | -1.4536E+00 | -1.4316E+00 |
| 42 | -1.6111E+00 | -1.5864E+00 | -1.5606E+00 | -1.5337E+00 | -1.5073E+00 | -1.4829E+00 |
| 41 | -1.6730E+00 | -1.6495E+00 | -1.6229E+00 | -1.5929E+00 | -1.5626E+00 | -1.5349E+00 |
| 40 | -1.7386E+00 | -1.7180E+00 | -1.6915E+00 | -1.6553E+00 | -1.6188E+00 | -1.5863E+00 |
| 39 | -1.8082E+00 | -1.7947E+00 | -1.7719E+00 | -1.7208E+00 | -1.6736E+00 | -1.6352E+00 |
| 38 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.7829E+00 | -1.7218E+00 | -1.6783E+00 |
| 37 | -1.7713E+00 | -1.8371E+00 | -1.8800E+00 | -1.8097E+00 | -1.7545E+00 | -1.7127E+00 |
| 36 | -1.6396E+00 | -1.8109E+00 | -1.8800E+00 | -1.8258E+00 | -1.7814E+00 | -1.7461E+00 |
| 35 | -1.4767E+00 | -1.8800E+00 | -1.8663E+00 | -1.8379E+00 | -1.8088E+00 | -1.7835E+00 |
| 34 | -1.2572E+00 | -1.8800E+00 | -1.8676E+00 | -1.8510E+00 | -1.8334E+00 | -1.8174E+00 |
| 33 | -9.1830E-01 | -1.8800E+00 | -1.8733E+00 | -1.8654E+00 | -1.8571E+00 | -1.8494E+00 |
| 32 | -2.6657E-01 | -9.6797E-01 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 |
| 31 | 5.0958E-01 | 4.1574E-02 | -4.1569E-01 | -6.1076E-01 | -7.0853E-01 | -7.6431E-01 |
| 30 | 1.2950E+00 | 9.6403E-01 | 6.6359E-01 | 4.6314E-01 | 3.3429E-01 | 2.5007E-01 |
| 29 | 2.0519E+00 | 1.8012E+00 | 1.5749E+00 | 1.3979E+00 | 1.2678E+00 | 1.1743E+00 |
| 28 | 2.7728E+00 | 2.5722E+00 | 2.3896E+00 | 2.2365E+00 | 2.1151E+00 | 2.0223E+00 |
| 27 | 3.4590E+00 | 3.2918E+00 | 3.1382E+00 | 3.0050E+00 | 2.8948E+00 | 2.8072E+00 |
| 26 | 4.2185E+00 | 4.0788E+00 | 3.9498E+00 | 3.8358E+00 | 3.7390E+00 | 3.6600E+00 |
| 25 | 5.0533E+00 | 4.9386E+00 | 4.8322E+00 | 4.7368E+00 | 4.6545E+00 | 4.5858E+00 |
| 24 | 5.8391E+00 | 5.7433E+00 | 5.6540E+00 | 5.5735E+00 | 5.5030E+00 | 5.4435E+00 |
| 23 | 6.5835E+00 | 6.5023E+00 | 6.4266E+00 | 6.3578E+00 | 6.2972E+00 | 6.2455E+00 |
| 22 | 7.2924E+00 | 7.2228E+00 | 7.1577E+00 | 7.0985E+00 | 7.0461E+00 | 7.0011E+00 |
| 21 | 7.9704E+00 | 7.9100E+00 | 7.8536E+00 | 7.8022E+00 | 7.7566E+00 | 7.7173E+00 |
| 20 | 8.6210E+00 | 8.5681E+00 | 8.5189E+00 | 8.4739E+00 | 8.4340E+00 | 8.3995E+00 |
| 19 | 9.2472E+00 | 9.2006E+00 | 9.1572E+00 | 9.1176E+00 | 9.0824E+00 | 9.0520E+00 |
| 18 | 9.8516E+00 | 9.8101E+00 | 9.7716E+00 | 9.7365E+00 | 9.7054E+00 | 9.6785E+00 |
| 17 | 1.0436E+01 | 1.0399E+01 | 1.0364E+01 | 1.0333E+01 | 1.0306E+01 | 1.0282E+01 |
| 16 | 1.1002E+01 | 1.0969E+01 | 1.0938E+01 | 1.0910E+01 | 1.0885E+01 | 1.0864E+01 |
| 15 | 1.1552E+01 | 1.1521E+01 | 1.1494E+01 | 1.1469E+01 | 1.1446E+01 | 1.1427E+01 |
| 14 | 1.2086E+01 | 1.2058E+01 | 1.2033E+01 | 1.2011E+01 | 1.1991E+01 | 1.1973E+01 |

| | 49 | 50 | 51 | 52 | 53 | 54 |
|---|---|---|---|---|---|---|
| 13 | 1.2605E+01 | 1.2580E+01 | 1.2558E+01 | 1.2537E+01 | 1.2519E+01 | 1.2504E+01 |
| 12 | 1.3112E+01 | 1.3089E+01 | 1.3068E+01 | 1.3050E+01 | 1.3034E+01 | 1.3020E+01 |
| 11 | 1.3605E+01 | 1.3584E+01 | 1.3566E+01 | 1.3549E+01 | 1.3535E+01 | 1.3523E+01 |
| 10 | 1.4087E+01 | 1.4068E+01 | 1.4052E+01 | 1.4037E+01 | 1.4024E+01 | 1.4013E+01 |
| 9 | 1.4557E+01 | 1.4541E+01 | 1.4526E+01 | 1.4513E+01 | 1.4502E+01 | 1.4493E+01 |
| 8 | 1.5018E+01 | 1.5003E+01 | 1.4990E+01 | 1.4979E+01 | 1.4969E+01 | 1.4961E+01 |
| 7 | 1.5468E+01 | 1.5456E+01 | 1.5445E+01 | 1.5435E+01 | 1.5427E+01 | 1.5420E+01 |
| 6 | 1.5909E+01 | 1.5899E+01 | 1.5890E+01 | 1.5882E+01 | 1.5875E+01 | 1.5869E+01 |
| 5 | 1.6342E+01 | 1.6334E+01 | 1.6327E+01 | 1.6320E+01 | 1.6315E+01 | 1.6310E+01 |
| 4 | 1.6767E+01 | 1.6761E+01 | 1.6756E+01 | 1.6751E+01 | 1.6747E+01 | 1.6743E+01 |
| 3 | 1.7185E+01 | 1.7181E+01 | 1.7177E+01 | 1.7174E+01 | 1.7171E+01 | 1.7169E+01 |
| 2 | 1.7596E+01 | 1.7594E+01 | 1.7592E+01 | 1.7590E+01 | 1.7589E+01 | 1.7588E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|
| 55 | -1.0543E+00 | -1.0427E+00 | -1.0335E+00 | -1.0264E+00 | -1.0217E+00 |
| 54 | -1.0657E+00 | -1.0543E+00 | -1.0454E+00 | -1.0389E+00 | -1.0340E+00 |
| 53 | -1.0748E+00 | -1.0634E+00 | -1.0546E+00 | -1.0483E+00 | -1.0440E+00 |
| 52 | -1.0894E+00 | -1.0780E+00 | -1.0691E+00 | -1.0629E+00 | -1.0588E+00 |
| 51 | -1.1091E+00 | -1.0976E+00 | -1.0887E+00 | -1.0825E+00 | -1.0784E+00 |
| 50 | -1.1336E+00 | -1.1220E+00 | -1.1130E+00 | -1.1068E+00 | -1.1028E+00 |
| 49 | -1.1627E+00 | -1.1509E+00 | -1.1418E+00 | -1.1355E+00 | -1.1316E+00 |
| 48 | -1.1960E+00 | -1.1839E+00 | -1.1747E+00 | -1.1684E+00 | -1.1645E+00 |
| 47 | -1.2333E+00 | -1.2208E+00 | -1.2113E+00 | -1.2049E+00 | -1.2010E+00 |
| 46 | -1.2741E+00 | -1.2611E+00 | -1.2512E+00 | -1.2446E+00 | -1.2407E+00 |
| 45 | -1.3179E+00 | -1.3042E+00 | -1.2939E+00 | -1.2869E+00 | -1.2831E+00 |
| 44 | -1.3642E+00 | -1.3496E+00 | -1.3386E+00 | -1.3313E+00 | -1.3275E+00 |
| 43 | -1.4124E+00 | -1.3966E+00 | -1.3848E+00 | -1.3771E+00 | -1.3732E+00 |
| 42 | -1.4617E+00 | -1.4444E+00 | -1.4316E+00 | -1.4233E+00 | -1.4194E+00 |
| 41 | -1.5111E+00 | -1.4921E+00 | -1.4781E+00 | -1.4692E+00 | -1.4652E+00 |
| 40 | -1.5594E+00 | -1.5384E+00 | -1.5233E+00 | -1.5139E+00 | -1.5099E+00 |
| 39 | -1.6051E+00 | -1.5823E+00 | -1.5663E+00 | -1.5565E+00 | -1.5524E+00 |
| 38 | -1.6460E+00 | -1.6223E+00 | -1.6059E+00 | -1.5960E+00 | -1.5919E+00 |
| 37 | -1.6813E+00 | -1.6583E+00 | -1.6424E+00 | -1.6329E+00 | -1.6292E+00 |
| 36 | -1.7189E+00 | -1.6987E+00 | -1.6847E+00 | -1.6763E+00 | -1.6729E+00 |
| 35 | -1.7631E+00 | -1.7475E+00 | -1.7366E+00 | -1.7301E+00 | -1.7275E+00 |
| 34 | -1.8040E+00 | -1.7935E+00 | -1.7861E+00 | -1.7817E+00 | -1.7799E+00 |
| 33 | -1.8428E+00 | -1.8377E+00 | -1.8340E+00 | -1.8318E+00 | -1.8309E+00 |
| 32 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 |
| 31 | -7.9885E-01 | -8.2096E-01 | -8.3481E-01 | -8.4248E-01 | -8.4495E-01 |
| 30 | 1.9394E-01 | 1.5654E-01 | 1.3259E-01 | 1.1918E-01 | 1.1483E-01 |
| 29 | 1.1079E+00 | 1.0620E+00 | 1.0318E+00 | 1.0147E+00 | 1.0091E+00 |
| 28 | 1.9534E+00 | 1.9040E+00 | 1.8709E+00 | 1.8519E+00 | 1.8456E+00 |
| 27 | 2.7400E+00 | 2.6906E+00 | 2.6570E+00 | 2.6375E+00 | 2.6310E+00 |
| 26 | 3.5979E+00 | 3.5515E+00 | 3.5194E+00 | 3.5005E+00 | 3.4942E+00 |
| 25 | 4.5309E+00 | 4.4891E+00 | 4.4598E+00 | 4.4425E+00 | 4.4366E+00 |
| 24 | 5.3952E+00 | 5.3580E+00 | 5.3317E+00 | 5.3160E+00 | 5.3107E+00 |
| 23 | 6.2032E+00 | 6.1703E+00 | 6.1469E+00 | 6.1328E+00 | 6.1280E+00 |
| 22 | 6.9640E+00 | 6.9350E+00 | 6.9143E+00 | 6.9018E+00 | 6.8975E+00 |
| 21 | 7.6847E+00 | 7.6592E+00 | 7.6408E+00 | 7.6297E+00 | 7.6259E+00 |
| 20 | 8.3708E+00 | 8.3483E+00 | 8.3321E+00 | 8.3222E+00 | 8.3188E+00 |
| 19 | 9.0267E+00 | 9.0068E+00 | 8.9925E+00 | 8.9837E+00 | 8.9807E+00 |
| 18 | 9.6561E+00 | 9.6384E+00 | 9.6256E+00 | 9.6179E+00 | 9.6152E+00 |
| 17 | 1.0262E+01 | 1.0246E+01 | 1.0235E+01 | 1.0228E+01 | 1.0225E+01 |
| 16 | 1.0846E+01 | 1.0832E+01 | 1.0822E+01 | 1.0816E+01 | 1.0814E+01 |

| | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|
| 15 | 1.1411E+01 | 1.1399E+01 | 1.1390E+01 | 1.1384E+01 | 1.1382E+01 |
| 14 | 1.1959E+01 | 1.1948E+01 | 1.1940E+01 | 1.1935E+01 | 1.1933E+01 |
| 13 | 1.2491E+01 | 1.2481E+01 | 1.2474E+01 | 1.2470E+01 | 1.2468E+01 |
| 12 | 1.3009E+01 | 1.3000E+01 | 1.2993E+01 | 1.2989E+01 | 1.2988E+01 |
| 11 | 1.3513E+01 | 1.3505E+01 | 1.3499E+01 | 1.3496E+01 | 1.3494E+01 |
| 10 | 1.4004E+01 | 1.3997E+01 | 1.3992E+01 | 1.3989E+01 | 1.3988E+01 |
| 9 | 1.4485E+01 | 1.4479E+01 | 1.4474E+01 | 1.4472E+01 | 1.4471E+01 |
| 8 | 1.4954E+01 | 1.4949E+01 | 1.4945E+01 | 1.4943E+01 | 1.4942E+01 |
| 7 | 1.5414E+01 | 1.5410E+01 | 1.5406E+01 | 1.5404E+01 | 1.5404E+01 |
| 6 | 1.5865E+01 | 1.5861E+01 | 1.5858E+01 | 1.5857E+01 | 1.5856E+01 |
| 5 | 1.6307E+01 | 1.6304E+01 | 1.6302E+01 | 1.6300E+01 | 1.6300E+01 |
| 4 | 1.6741E+01 | 1.6738E+01 | 1.6737E+01 | 1.6736E+01 | 1.6736E+01 |
| 3 | 1.7167E+01 | 1.7166E+01 | 1.7165E+01 | 1.7164E+01 | 1.7164E+01 |
| 2 | 1.7587E+01 | 1.7586E+01 | 1.7586E+01 | 1.7585E+01 | 1.7585E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

************ End of logbook ************

Units of all fluxes in [ft^3/d]

| i | j | flux | CodeID | Node# | |
|---|---|---|---|---|---|
| 12 | 55 | -0.4255 | 2 | 1 | constant head |
| 13 | 54 | -3.3648 | 2 | 2 | constant head |
| 14 | 53 | -6.6747 | 2 | 3 | constant head |
| 15 | 52 | -9.9092 | 2 | 4 | constant head |
| 16 | 51 | -12.9984 | 2 | 5 | constant head |
| 17 | 50 | -15.8781 | 2 | 6 | constant head |
| 18 | 49 | -18.4543 | 2 | 7 | constant head |
| 19 | 48 | -20.5827 | 2 | 8 | constant head |
| 20 | 47 | -21.9818 | 2 | 9 | constant head |
| 21 | 46 | -21.7291 | 2 | 10 | constant head |
| 33 | 41 | -577.5094 | 2 | 11 | constant head |
| 52 | 32 | -528.9418 | 2 | 12 | constant head |
| 49 | 38 | -125.4093 | 2 | 13 | constant head |
| 28 | 43 | -287.3230 | 2 | 14 | constant head |
| 51 | 36 | -54.0224 | 2 | 15 | constant head |
| 43 | 40 | -197.0604 | 2 | 16 | constant head |
| 40 | 40 | -394.2366 | 2 | 17 | constant head |
| 40 | 41 | -69.7800 | 2 | 18 | constant head |
| 23 | 45 | -33.7594 | 2 | 19 | constant head |
| 47 | 38 | -214.3031 | 2 | 20 | constant head |
| 30 | 42 | -548.6966 | 2 | 21 | constant head |
| 41 | 40 | -240.2520 | 2 | 22 | constant head |
| 51 | 38 | -142.6366 | 2 | 23 | constant head |
| 50 | 35 | -193.7997 | 2 | 24 | constant head |
| 50 | 34 | -255.7519 | 2 | 25 | constant head |
| 50 | 38 | -89.0331 | 2 | 26 | constant head |
| 35 | 41 | -293.4658 | 2 | 27 | constant head |
| 46 | 38 | -260.0158 | 2 | 28 | constant head |
| 25 | 43 | -772.9712 | 2 | 29 | constant head |
| 39 | 41 | -171.2358 | 2 | 30 | constant head |
| 34 | 41 | -322.0326 | 2 | 31 | constant head |
| 44 | 40 | -181.0925 | 2 | 32 | constant head |
| 42 | 40 | -216.3195 | 2 | 33 | constant head |
| 37 | 41 | -251.6877 | 2 | 34 | constant head |
| 51 | 37 | -78.5601 | 2 | 35 | constant head |
| 45 | 39 | -148.7586 | 2 | 36 | constant head |
| 25 | 44 | -32.3189 | 2 | 37 | constant head |
| 48 | 38 | -169.5642 | 2 | 38 | constant head |
| 32 | 42 | -254.1631 | 2 | 39 | constant head |
| 26 | 43 | -462.1514 | 2 | 40 | constant head |
| 22 | 45 | -10.5037 | 2 | 41 | constant head |
| 36 | 41 | -272.5090 | 2 | 42 | constant head |
| 38 | 41 | -223.3044 | 2 | 43 | constant head |
| 50 | 33 | -766.0453 | 2 | 44 | constant head |
| 51 | 32 | -981.5584 | 2 | 45 | constant head |
| 45 | 38 | -536.8463 | 2 | 46 | constant head |
| 53 | 32 | -490.2581 | 2 | 47 | constant head |
| 54 | 32 | -469.4911 | 2 | 48 | constant head |
| 55 | 32 | -457.3825 | 2 | 49 | constant head |
| 56 | 32 | -450.0263 | 2 | 50 | constant head |
| 57 | 32 | -445.6067 | 2 | 51 | constant head |
| 58 | 32 | -443.2335 | 2 | 52 | constant head |
| 59 | 32 | -221.2635 | 2 | 53 | constant head |
| 59 | 1 | 172.9028 | 1 | 54 | constant head |
| 58 | 1 | 345.7140 | 1 | 55 | constant head |
| 57 | 1 | 345.4653 | 1 | 56 | constant head |

| | | | | | |
|---|---|---|---|---|---|
| 56 | 1 | 345.0525 | 1 | 57 | constant head |
| 55 | 1 | 344.4745 | 1 | 58 | constant head |
| 54 | 1 | 343.7288 | 1 | 59 | constant head |
| 53 | 1 | 342.8118 | 1 | 60 | constant head |
| 52 | 1 | 341.7188 | 1 | 61 | constant head |
| 51 | 1 | 340.4420 | 1 | 62 | constant head |
| 50 | 1 | 338.9714 | 1 | 63 | constant head |
| 49 | 1 | 337.2934 | 1 | 64 | constant head |
| 48 | 1 | 335.3892 | 1 | 65 | constant head |
| 47 | 1 | 333.2323 | 1 | 66 | constant head |
| 46 | 1 | 330.7925 | 1 | 67 | constant head |
| 45 | 1 | 328.0246 | 1 | 68 | constant head |
| 44 | 1 | 324.8741 | 1 | 69 | constant head |
| 43 | 1 | 321.2705 | 1 | 70 | constant head |
| 42 | 1 | 317.1214 | 1 | 71 | constant head |
| 41 | 1 | 312.3131 | 1 | 72 | constant head |
| 40 | 1 | 306.6989 | 1 | 73 | constant head |
| 39 | 1 | 300.0953 | 1 | 74 | constant head |
| 38 | 1 | 292.2678 | 1 | 75 | constant head |
| 37 | 1 | 282.9222 | 1 | 76 | constant head |
| 36 | 1 | 271.6702 | 1 | 77 | constant head |
| 35 | 1 | 257.9831 | 1 | 78 | constant head |
| 34 | 1 | 241.0592 | 1 | 79 | constant head |
| 33 | 1 | 219.5051 | 1 | 80 | constant head |
| 32 | 1 | 163.4403 | 1 | 81 | constant head |
| 31 | 1 | 86.2353 | 1 | 82 | constant head |
| 30 | 1 | 59.3910 | 1 | 83 | constant head |
| 29 | 1 | 77.7973 | 1 | 84 | constant head |
| 28 | 1 | 76.6574 | 1 | 85 | constant head |
| 27 | 1 | 65.4393 | 1 | 86 | constant head |
| 26 | 1 | 89.0365 | 1 | 87 | constant head |
| 25 | 1 | 79.1070 | 1 | 88 | constant head |
| 24 | 1 | 39.4874 | 1 | 89 | constant head |
| 23 | 1 | 47.4109 | 1 | 90 | constant head |
| 22 | 1 | 48.2752 | 1 | 91 | constant head |
| 21 | 1 | 31.0607 | 1 | 92 | constant head |
| 20 | 1 | 19.3798 | 1 | 93 | constant head |
| 19 | 1 | 12.5250 | 1 | 94 | constant head |
| 18 | 1 | 9.6356 | 1 | 95 | constant head |
| 17 | 1 | 10.0101 | 1 | 96 | constant head |
| 16 | 1 | 13.1633 | 1 | 97 | constant head |
| 15 | 1 | 18.7929 | 1 | 98 | constant head |
| 14 | 1 | 26.7477 | 1 | 99 | constant head |
| 13 | 1 | 36.9967 | 1 | 100 | constant head |
| 12 | 1 | 49.6263 | 1 | 101 | constant head |
| 11 | 1 | 64.8381 | 1 | 102 | constant head |
| 10 | 1 | 82.9787 | 1 | 103 | constant head |
| 9 | 1 | 104.5800 | 1 | 104 | constant head |
| 8 | 1 | 130.4613 | 1 | 105 | constant head |
| 7 | 1 | 161.9121 | 1 | 106 | constant head |
| 6 | 1 | 201.0725 | 1 | 107 | constant head |
| 5 | 1 | 251.8038 | 1 | 108 | constant head |
| 4 | 1 | 321.8583 | 1 | 109 | constant head |
| 3 | 1 | 429.0353 | 1 | 110 | constant head |
| 2 | 1 | 1057.7182 | 1 | 111 | constant head |
| 59 | 31 | 0.0000 | 3 | 1 | flux node |
| 59 | 30 | 0.0000 | 3 | 2 | flux node |
| 59 | 29 | 0.0000 | 3 | 3 | flux node |

| | | | | | |
|---|---|---|---|---|---|
| 59 | 28 | 0.0000 | 3 | 4 | flux node |
| 59 | 27 | 0.0000 | 3 | 5 | flux node |
| 59 | 26 | 0.0000 | 3 | 6 | flux node |
| 59 | 25 | 0.0000 | 3 | 7 | flux node |
| 59 | 24 | 0.0000 | 3 | 8 | flux node |
| 59 | 23 | 0.0000 | 3 | 9 | flux node |
| 59 | 22 | 0.0000 | 3 | 10 | flux node |
| 59 | 21 | 0.0000 | 3 | 11 | flux node |
| 59 | 20 | 0.0000 | 3 | 12 | flux node |
| 59 | 19 | 0.0000 | 3 | 13 | flux node |
| 59 | 18 | 0.0000 | 3 | 14 | flux node |
| 59 | 17 | 0.0000 | 3 | 15 | flux node |
| 59 | 16 | 0.0000 | 3 | 16 | flux node |
| 59 | 15 | 0.0000 | 3 | 17 | flux node |
| 59 | 14 | 0.0000 | 3 | 18 | flux node |
| 59 | 13 | 0.0000 | 3 | 19 | flux node |
| 59 | 12 | 0.0000 | 3 | 20 | flux node |
| 59 | 11 | 0.0000 | 3 | 21 | flux node |
| 59 | 10 | 0.0000 | 3 | 22 | flux node |
| 59 | 9 | 0.0000 | 3 | 23 | flux node |
| 59 | 8 | 0.0000 | 3 | 24 | flux node |
| 59 | 7 | 0.0000 | 3 | 25 | flux node |
| 59 | 6 | 0.0000 | 3 | 26 | flux node |
| 59 | 5 | 0.0000 | 3 | 27 | flux node |
| 59 | 4 | 0.0000 | 3 | 28 | flux node |
| 59 | 3 | 0.0000 | 3 | 29 | flux node |
| 59 | 2 | 0.0000 | 3 | 30 | flux node |
| 1 | 27 | -364.4253 | 4 | 31 | flux node |
| 1 | 2 | -354.7265 | 4 | 32 | flux node |
| 1 | 3 | -349.3327 | 4 | 33 | flux node |
| 1 | 4 | -343.9958 | 4 | 34 | flux node |
| 1 | 5 | -339.1058 | 4 | 35 | flux node |
| 1 | 6 | -334.6320 | 4 | 36 | flux node |
| 1 | 7 | -330.4839 | 4 | 37 | flux node |
| 1 | 8 | -326.5775 | 4 | 38 | flux node |
| 1 | 9 | -322.8436 | 4 | 39 | flux node |
| 1 | 10 | -319.2258 | 4 | 40 | flux node |
| 1 | 11 | -315.6762 | 4 | 41 | flux node |
| 1 | 12 | -312.1533 | 4 | 42 | flux node |
| 1 | 13 | -308.6194 | 4 | 43 | flux node |
| 1 | 14 | -305.0395 | 4 | 44 | flux node |
| 1 | 15 | -301.3806 | 4 | 45 | flux node |
| 1 | 16 | -297.6114 | 4 | 46 | flux node |
| 1 | 17 | -293.7026 | 4 | 47 | flux node |
| 1 | 18 | -289.6267 | 4 | 48 | flux node |
| 1 | 19 | -285.3566 | 4 | 49 | flux node |
| 1 | 20 | -280.8610 | 4 | 50 | flux node |
| 1 | 21 | -276.1011 | 4 | 51 | flux node |
| 1 | 22 | -271.0304 | 4 | 52 | flux node |
| 1 | 23 | -265.6085 | 4 | 53 | flux node |
| 1 | 24 | -259.8455 | 4 | 54 | flux node |
| 1 | 25 | -253.9441 | 4 | 55 | flux node |
| 1 | 26 | -248.4593 | 4 | 56 | flux node |
| 1 | 1 | -357.5100 | 4 | 57 | flux node |
| 24 | 5 | -304.6392 | 5 | 1 | river node |
| 27 | 7 | -405.3845 | 5 | 2 | river node |
| 32 | 10 | -193.6170 | 5 | 3 | river node |
| 32 | 12 | -2.4436 | 5 | 4 | river node |

| | | | | | |
|---|---|---|---|---|---|
| 31 | 16 | -458.1537 | 5 | 5 | river node |
| 29 | 19 | -736.7656 | 5 | 6 | river node |
| 28 | 21 | -990.5163 | 5 | 7 | river node |
| 26 | 24 | -650.1358 | 5 | 8 | river node |
| 25 | 27 | -426.0088 | 5 | 9 | river node |
| 24 | 29 | -204.0195 | 5 | 10 | river node |
| 25 | 42 | 1043.6692 | 5 | 11 | river node |
| 20 | 33 | 73.2304 | 5 | 12 | river node |
| 20 | 38 | 246.3910 | 5 | 13 | river node |

Sum of all fluxes organized in Codes :

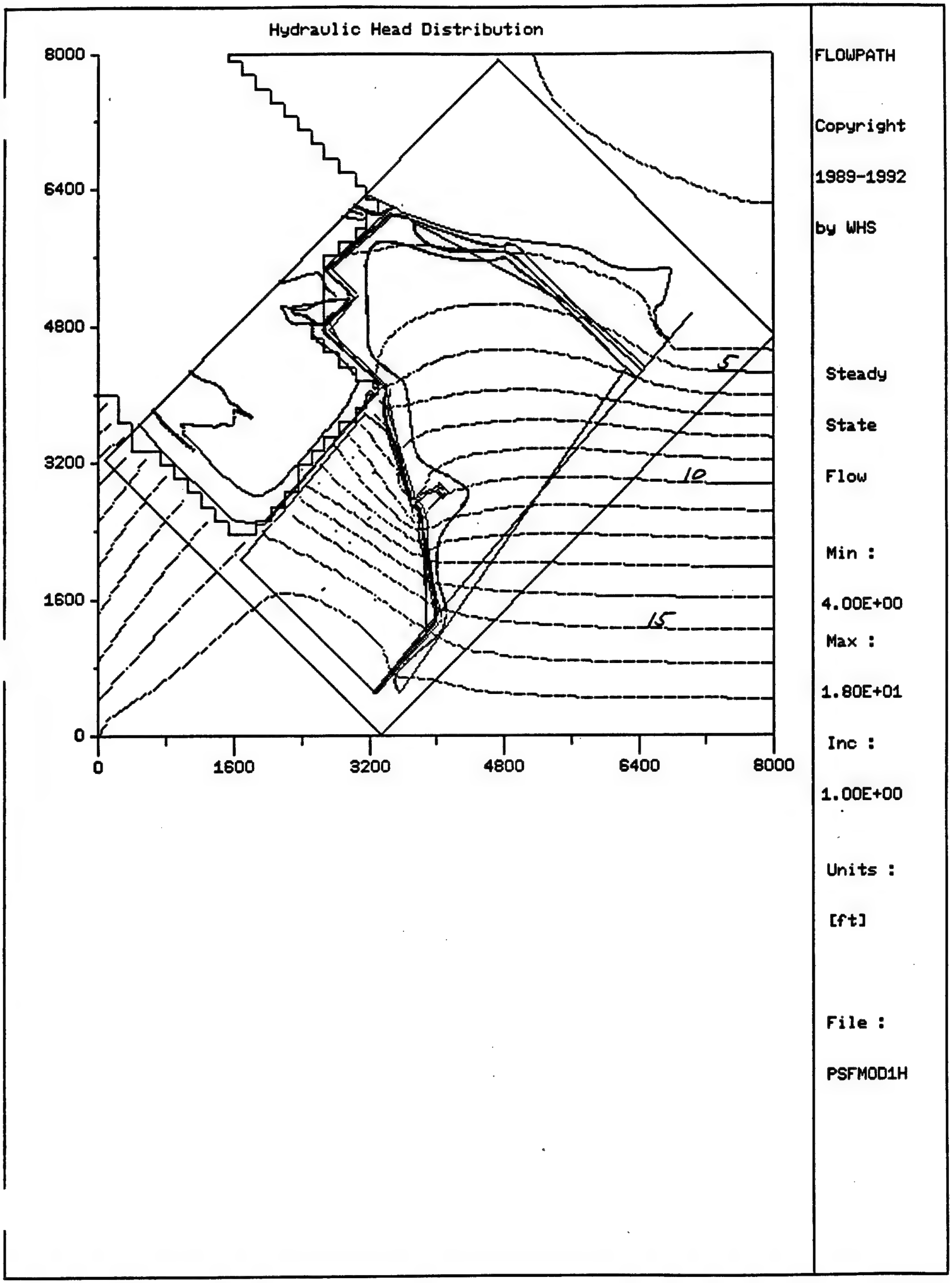
5

| | | | |
|---|---|---|---|
| 1 | 12240.2676 | CodeID | Total flux |
| 2 | -13466.8799 | CodeID | Total flux |
| 3 | 0.0000 | CodeID | Total flux |
| 4 | -8307.8750 | CodeID | Total flux |
| 5 | -3008.3933 | CodeID | Total flux |

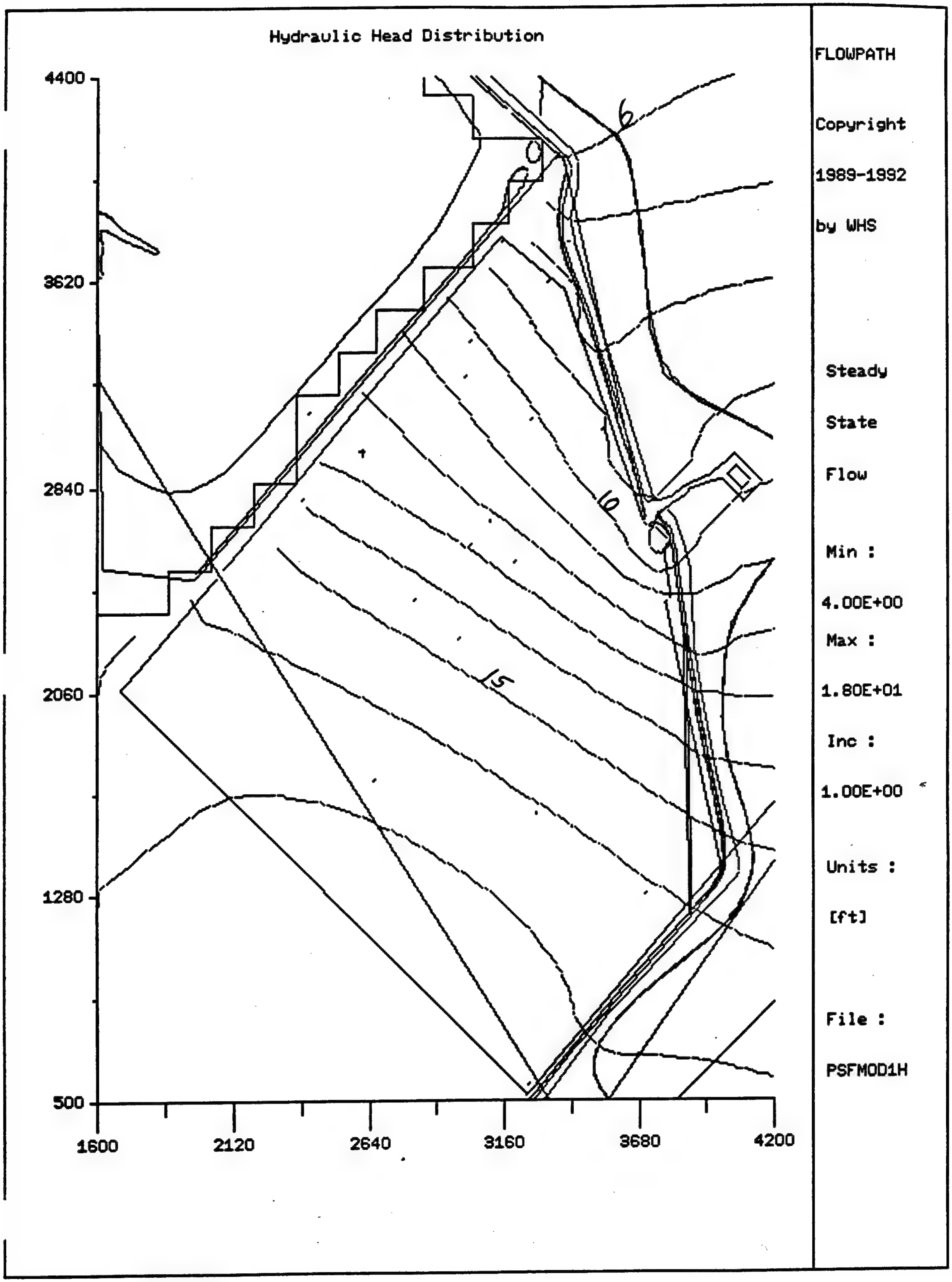
Global water balance [ft^3/d] :

| | |
|---|---|
| 12240.2692 | total IN-flux through const. head nodes |
| -13466.8797 | total OUT-flux through const. head nodes |
| 0.0000 | total IN-flux through flux nodes |
| -8307.8752 | total OUT-flux through flux nodes |
| 1363.2907 | total IN-flux through river nodes |
| -4371.6841 | total OUT-flux through river nodes |
| 0.0000 | total IN-flux through injection wells |
| 0.0000 | total OUT-flux through pumping wells |
| 11361.3895 | total net aquifer recharge |
| -1181.4896 | sum of all fluxes should be zero |
| -2.3116% | total mass balance error |

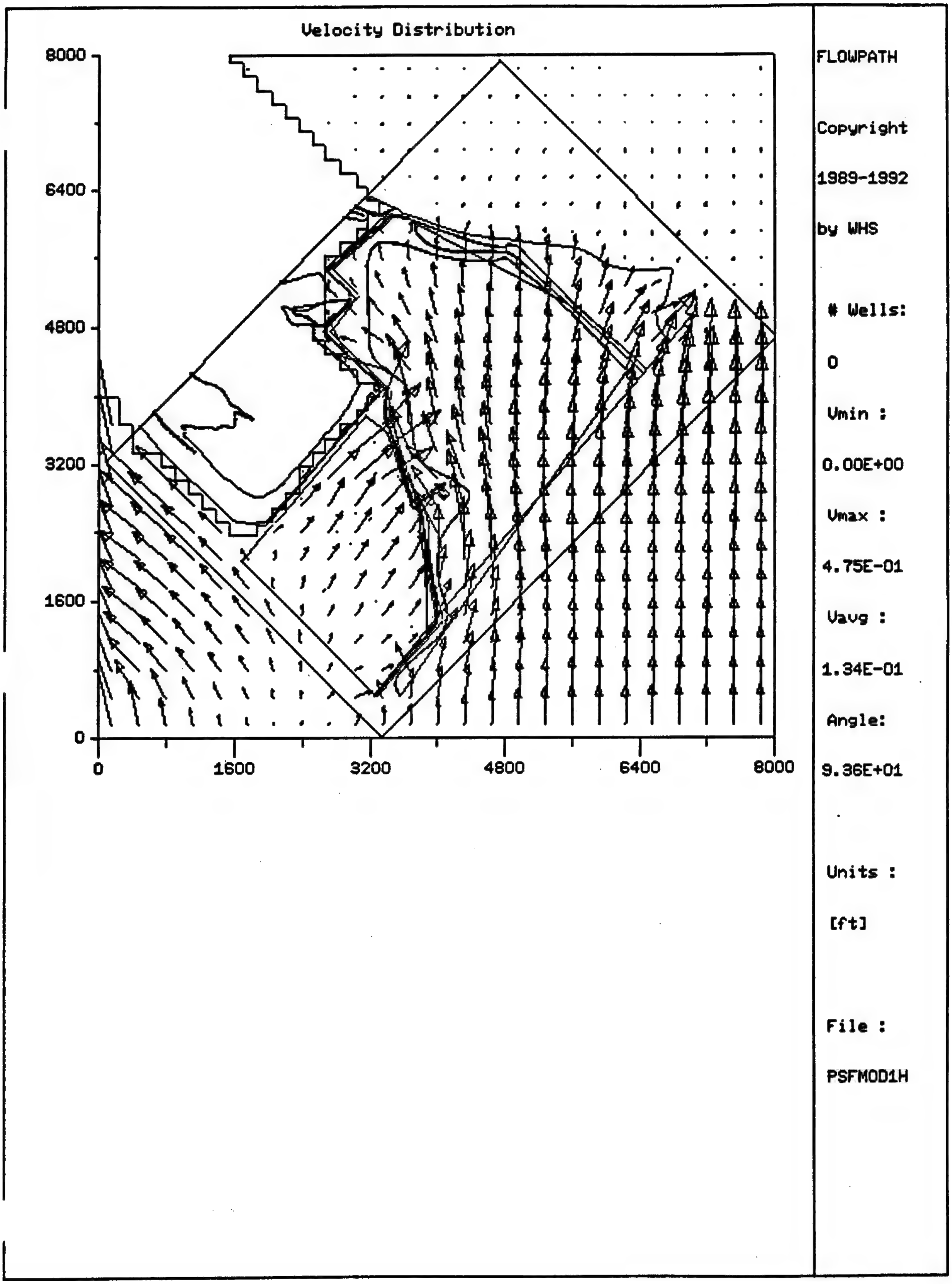
PSFMOD1H



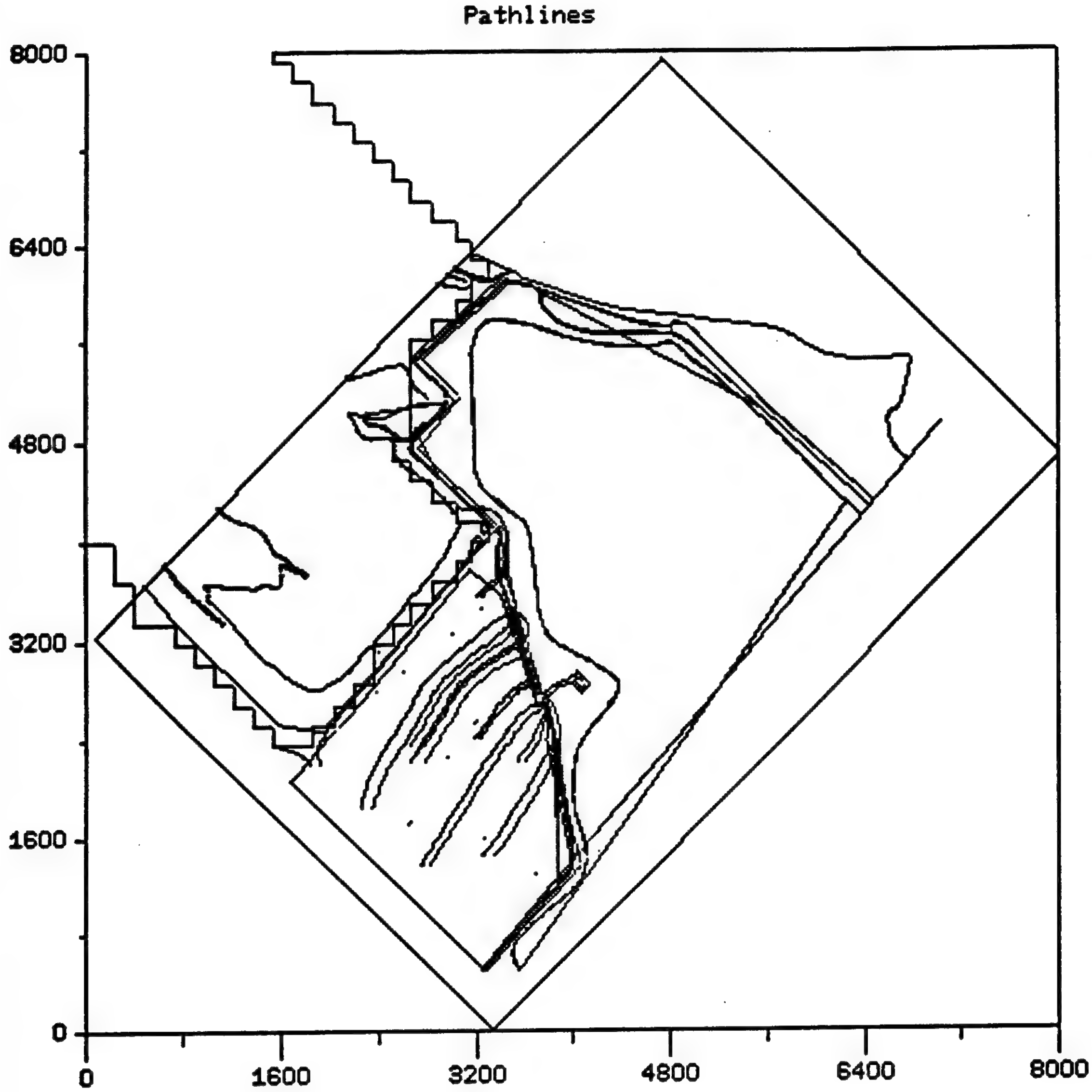
Hydraulic Head Distribution
8000
6400
4800
3200
1600
0
0
1600
3200
4800
6400
8000
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
4.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD1H



Hydraulic Head Distribution
4400
3620
2840
2060
1280
500
1600
2120
2640
3160
3680
4200
6
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
4.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD1H



Velocity Distribution
8000
6400
4800
3200
1600
0
0
1600
3200
4800
6400
8000
FLOWPATH
Copyright
1989-1992
by WHS
# Wells:
0
Vmin :
0.00E+00
Vmax :
4.75E-01
Vavg :
1.34E-01
Angle:
9.36E+01
Units :
[ft]
File :
PSFMOD1H




FLOWPATH

Copyright

1989-1992

by WHS

Steady

State

Flow

Time :

steady

Units :

[ft]

File :

PSFMOD1H

^[S^A
^[C(

```
*************************************************************
*                     E C H O P R I N T                     *
*                                                           *
*                       F L O W P A T H                     *
*                        version 3.0                        *
*                                                           *
*  FLOWPATH was written by Thomas Franz and Nilson Guiguer  *
*                                                           *
*************************************************************
*                                                           *
*                   Copyright 1989, 1992                    *
*                            by                             *
*              Waterloo Hydrogeologic Software              *
*                 200 Candlewood Crescent                   *
*                    Waterloo, Ontario                      *
*                    N2L 5Y9, Canada                        *
*                                                           *
*                    ph (519) 746-1798                      *
*                                                           *
*************************************************************
```

FLOWPATH logbook for data set : PSFMOD1H

Unit System : English units [ft/gal/d]

***** GRID PARAMETERS *****

Number of x-grid lines : 56

Number of y-grid lines : 50

Grid coordinates (x-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 1.63265E+02 |
| 3 | 3.26531E+02 |
| 4 | 4.89796E+02 |
| 5 | 6.53061E+02 |
| 6 | 8.16327E+02 |
| 7 | 9.79592E+02 |
| 8 | 1.14286E+03 |
| 9 | 1.30612E+03 |
| 10 | 1.46939E+03 |
| 11 | 1.63265E+03 |
| 12 | 1.79592E+03 |
| 13 | 1.95918E+03 |
| 14 | 2.12245E+03 |
| 15 | 2.28571E+03 |

| | |
|---|---|
| 16 | 2.44898E+03 |
| 17 | 2.61224E+03 |
| 18 | 2.72566E+03 |
| 19 | 2.77551E+03 |
| 20 | 2.93878E+03 |
| 21 | 2.99115E+03 |
| 22 | 3.10204E+03 |
| 23 | 3.26531E+03 |
| 24 | 3.36283E+03 |
| 25 | 3.41593E+03 |
| 26 | 3.42857E+03 |
| 27 | 3.52212E+03 |
| 28 | 3.59184E+03 |
| 29 | 3.68142E+03 |
| 30 | 3.75510E+03 |
| 31 | 3.91837E+03 |
| 32 | 4.08163E+03 |
| 33 | 4.24490E+03 |
| 34 | 4.40816E+03 |
| 35 | 4.57143E+03 |
| 36 | 4.73469E+03 |
| 37 | 4.89796E+03 |
| 38 | 5.06122E+03 |
| 39 | 5.22449E+03 |
| 40 | 5.38776E+03 |
| 41 | 5.55102E+03 |
| 42 | 5.71429E+03 |
| 43 | 5.87755E+03 |
| 44 | 6.04082E+03 |
| 45 | 6.20408E+03 |
| 46 | 6.36735E+03 |
| 47 | 6.53061E+03 |
| 48 | 6.69388E+03 |
| 49 | 6.85714E+03 |
| 50 | 7.02041E+03 |
| 51 | 7.18367E+03 |
| 52 | 7.34694E+03 |
| 53 | 7.51020E+03 |
| 54 | 7.67347E+03 |
| 55 | 7.83673E+03 |
| 56 | 8.00000E+03 |

**Grid coordinates (y-grid lines) [ft] :**

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 1.63265E+02 |
| 3 | 3.26531E+02 |
| 4 | 4.89796E+02 |
| 5 | 6.53061E+02 |
| 6 | 8.16327E+02 |
| 7 | 9.79592E+02 |
| 8 | 1.14286E+03 |
| 9 | 1.30612E+03 |
| 10 | 1.46939E+03 |
| 11 | 1.63265E+03 |
| 12 | 1.79592E+03 |
| 13 | 1.95918E+03 |

| | |
|---|---|
| 14 | 2.12245E+03 |
| 15 | 2.28571E+03 |
| 16 | 2.44898E+03 |
| 17 | 2.61224E+03 |
| 18 | 2.77551E+03 |
| 19 | 2.93878E+03 |
| 20 | 3.10204E+03 |
| 21 | 3.26531E+03 |
| 22 | 3.42857E+03 |
| 23 | 3.59184E+03 |
| 24 | 3.75510E+03 |
| 25 | 3.91837E+03 |
| 26 | 4.08163E+03 |
| 27 | 4.24490E+03 |
| 28 | 4.40816E+03 |
| 29 | 4.57143E+03 |
| 30 | 4.73469E+03 |
| 31 | 4.89796E+03 |
| 32 | 5.06122E+03 |
| 33 | 5.22449E+03 |
| 34 | 5.38776E+03 |
| 35 | 5.55102E+03 |
| 36 | 5.71429E+03 |
| 37 | 5.87755E+03 |
| 38 | 6.04082E+03 |
| 39 | 6.20408E+03 |
| 40 | 6.36735E+03 |
| 41 | 6.53061E+03 |
| 42 | 6.69388E+03 |
| 43 | 6.85714E+03 |
| 44 | 7.02041E+03 |
| 45 | 7.18367E+03 |
| 46 | 7.34694E+03 |
| 47 | 7.51020E+03 |
| 48 | 7.67347E+03 |
| 49 | 7.83673E+03 |
| 50 | 8.00000E+03 |

***** WELL PARAMETERS *****

Number of wells : 0

***** CONSTRAINED HEAD NODES *****

Number of constant head nodes : 97

| No. | i | j | X [ft] | Y [ft] | const. head [ft] |
|---|---|---|---|---|---|
| 1 | 2 | 1 | 1.59292E+02 | 0.00000E+00 | 1.80000E+01 |
| 2 | 3 | 1 | 3.18584E+02 | 0.00000E+00 | 1.80000E+01 |
| 3 | 4 | 1 | 4.95575E+02 | 0.00000E+00 | 1.80000E+01 |

| | | | | | |
|---|---|---|---|---|---|
| 4 | 5 | 1 | 6.54867E+02 | 0.00000E+00 | 1.80000E+01 |
| 5 | 6 | 1 | 8.14159E+02 | 0.00000E+00 | 1.80000E+01 |
| 6 | 7 | 1 | 9.73451E+02 | 0.00000E+00 | 1.80000E+01 |
| 7 | 8 | 1 | 1.15044E+03 | 0.00000E+00 | 1.80000E+01 |
| 8 | 9 | 1 | 1.30973E+03 | 0.00000E+00 | 1.80000E+01 |
| 9 | 10 | 1 | 1.46903E+03 | 0.00000E+00 | 1.80000E+01 |
| 10 | 11 | 1 | 1.62832E+03 | 0.00000E+00 | 1.80000E+01 |
| 11 | 12 | 1 | 1.78761E+03 | 0.00000E+00 | 1.80000E+01 |
| 12 | 13 | 1 | 1.96460E+03 | 0.00000E+00 | 1.80000E+01 |
| 13 | 14 | 1 | 2.12389E+03 | 0.00000E+00 | 1.80000E+01 |
| 14 | 15 | 1 | 2.28319E+03 | 0.00000E+00 | 1.80000E+01 |
| 15 | 16 | 1 | 2.44248E+03 | 0.00000E+00 | 1.80000E+01 |
| 16 | 17 | 1 | 2.61947E+03 | 0.00000E+00 | 1.80000E+01 |
| 17 | 19 | 1 | 2.77876E+03 | 0.00000E+00 | 1.80000E+01 |
| 18 | 20 | 1 | 2.93805E+03 | 0.00000E+00 | 1.80000E+01 |
| 19 | 22 | 1 | 3.09735E+03 | 0.00000E+00 | 1.80000E+01 |
| 20 | 23 | 1 | 3.25664E+03 | 0.00000E+00 | 1.80000E+01 |
| 21 | 26 | 1 | 3.43363E+03 | 0.00000E+00 | 1.80000E+01 |
| 22 | 28 | 1 | 3.59292E+03 | 0.00000E+00 | 1.80000E+01 |
| 23 | 30 | 1 | 3.75221E+03 | 0.00000E+00 | 1.80000E+01 |
| 24 | 31 | 1 | 3.91150E+03 | 0.00000E+00 | 1.80000E+01 |
| 25 | 32 | 1 | 4.08850E+03 | 0.00000E+00 | 1.80000E+01 |
| 26 | 33 | 1 | 4.24779E+03 | 0.00000E+00 | 1.80000E+01 |
| 27 | 34 | 1 | 4.40708E+03 | 0.00000E+00 | 1.80000E+01 |
| 28 | 35 | 1 | 4.56637E+03 | 0.00000E+00 | 1.80000E+01 |
| 29 | 36 | 1 | 4.74336E+03 | 0.00000E+00 | 1.80000E+01 |
| 30 | 37 | 1 | 4.90265E+03 | 0.00000E+00 | 1.80000E+01 |
| 31 | 38 | 1 | 5.06195E+03 | 0.00000E+00 | 1.80000E+01 |
| 32 | 39 | 1 | 5.22124E+03 | 0.00000E+00 | 1.80000E+01 |
| 33 | 40 | 1 | 5.38053E+03 | 0.00000E+00 | 1.80000E+01 |
| 34 | 41 | 1 | 5.55752E+03 | 0.00000E+00 | 1.80000E+01 |
| 35 | 42 | 1 | 5.71681E+03 | 0.00000E+00 | 1.80000E+01 |
| 36 | 43 | 1 | 5.87611E+03 | 0.00000E+00 | 1.80000E+01 |
| 37 | 44 | 1 | 6.03540E+03 | 0.00000E+00 | 1.80000E+01 |
| 38 | 45 | 1 | 6.21239E+03 | 0.00000E+00 | 1.80000E+01 |
| 39 | 46 | 1 | 6.37168E+03 | 0.00000E+00 | 1.80000E+01 |
| 40 | 47 | 1 | 6.53097E+03 | 0.00000E+00 | 1.80000E+01 |
| 41 | 48 | 1 | 6.69027E+03 | 0.00000E+00 | 1.80000E+01 |
| 42 | 49 | 1 | 6.84956E+03 | 0.00000E+00 | 1.80000E+01 |
| 43 | 50 | 1 | 7.02655E+03 | 0.00000E+00 | 1.80000E+01 |
| 44 | 51 | 1 | 7.18584E+03 | 0.00000E+00 | 1.80000E+01 |
| 45 | 52 | 1 | 7.34513E+03 | 0.00000E+00 | 1.80000E+01 |
| 46 | 53 | 1 | 7.50442E+03 | 0.00000E+00 | 1.80000E+01 |
| 47 | 54 | 1 | 7.68142E+03 | 0.00000E+00 | 1.80000E+01 |
| 48 | 55 | 1 | 7.84071E+03 | 0.00000E+00 | 1.80000E+01 |
| 49 | 56 | 1 | 8.00000E+03 | 0.00000E+00 | 1.80000E+01 |
| 50 | 56 | 29 | 8.00000E+03 | 4.56637E+03 | 3.75000E+00 |
| 51 | 55 | 29 | 7.84071E+03 | 4.56637E+03 | 3.75000E+00 |
| 52 | 54 | 29 | 7.68142E+03 | 4.56637E+03 | 3.75000E+00 |
| 53 | 53 | 29 | 7.50442E+03 | 4.56637E+03 | 3.75000E+00 |
| 54 | 52 | 29 | 7.34513E+03 | 4.56637E+03 | 3.75000E+00 |
| 55 | 51 | 29 | 7.18584E+03 | 4.56637E+03 | 3.75000E+00 |
| 56 | 50 | 29 | 7.02655E+03 | 4.56637E+03 | 3.75000E+00 |
| 57 | 49 | 29 | 6.84956E+03 | 4.56637E+03 | 3.75000E+00 |
| 58 | 49 | 30 | 6.84956E+03 | 4.74336E+03 | 3.75000E+00 |
| 59 | 48 | 30 | 6.69027E+03 | 4.74336E+03 | 3.75000E+00 |
| 60 | 48 | 31 | 6.69027E+03 | 4.90265E+03 | 3.75000E+00 |
| 61 | 48 | 32 | 6.69027E+03 | 5.06195E+03 | 3.75000E+00 |

| | | | | | |
|---|---|---|---|---|---|
| 62 | 49 | 33 | 6.84956E+03 | 5.22124E+03 | 3.75000E+00 |
| 63 | 49 | 34 | 6.84956E+03 | 5.38053E+03 | 3.75000E+00 |
| 64 | 49 | 35 | 6.84956E+03 | 5.55752E+03 | 3.75000E+00 |
| 65 | 48 | 35 | 6.69027E+03 | 5.55752E+03 | 3.75000E+00 |
| 66 | 47 | 35 | 6.53097E+03 | 5.55752E+03 | 3.75000E+00 |
| 67 | 46 | 35 | 6.37168E+03 | 5.55752E+03 | 3.75000E+00 |
| 68 | 45 | 35 | 6.21239E+03 | 5.55752E+03 | 3.75000E+00 |
| 69 | 44 | 35 | 6.03540E+03 | 5.55752E+03 | 3.75000E+00 |
| 70 | 44 | 36 | 6.03540E+03 | 5.71681E+03 | 3.75000E+00 |
| 71 | 43 | 36 | 5.87611E+03 | 5.71681E+03 | 3.75000E+00 |
| 72 | 42 | 36 | 5.71681E+03 | 5.71681E+03 | 3.75000E+00 |
| 73 | 41 | 36 | 5.55752E+03 | 5.71681E+03 | 3.75000E+00 |
| 74 | 40 | 37 | 5.38053E+03 | 5.87611E+03 | 3.75000E+00 |
| 75 | 39 | 37 | 5.22124E+03 | 5.87611E+03 | 3.75000E+00 |
| 76 | 38 | 37 | 5.06195E+03 | 5.87611E+03 | 3.75000E+00 |
| 77 | 37 | 37 | 4.90265E+03 | 5.87611E+03 | 3.75000E+00 |
| 78 | 36 | 37 | 4.74336E+03 | 5.87611E+03 | 3.75000E+00 |
| 79 | 35 | 37 | 4.56637E+03 | 5.87611E+03 | 3.75000E+00 |
| 80 | 34 | 37 | 4.40708E+03 | 5.87611E+03 | 3.75000E+00 |
| 81 | 32 | 38 | 4.08850E+03 | 6.03540E+03 | 3.75000E+00 |
| 82 | 31 | 38 | 3.91150E+03 | 6.03540E+03 | 3.75000E+00 |
| 83 | 30 | 39 | 3.75221E+03 | 6.21239E+03 | 3.75000E+00 |
| 84 | 28 | 39 | 3.59292E+03 | 6.21239E+03 | 3.75000E+00 |
| 85 | 26 | 39 | 3.43363E+03 | 6.21239E+03 | 3.75000E+00 |
| 86 | 23 | 40 | 3.25664E+03 | 6.37168E+03 | 3.75000E+00 |
| 87 | 22 | 41 | 3.09735E+03 | 6.53097E+03 | 3.75000E+00 |
| 88 | 20 | 42 | 2.93805E+03 | 6.69027E+03 | 3.75000E+00 |
| 89 | 19 | 43 | 2.77876E+03 | 6.84956E+03 | 3.75000E+00 |
| 90 | 17 | 44 | 2.61947E+03 | 7.02655E+03 | 3.75000E+00 |
| 91 | 16 | 45 | 2.44248E+03 | 7.18584E+03 | 3.75000E+00 |
| 92 | 15 | 46 | 2.28319E+03 | 7.34513E+03 | 3.75000E+00 |
| 93 | 14 | 47 | 2.12389E+03 | 7.50442E+03 | 3.75000E+00 |
| 94 | 13 | 48 | 1.96460E+03 | 7.68142E+03 | 3.75000E+00 |
| 95 | 12 | 49 | 1.78761E+03 | 7.84071E+03 | 3.75000E+00 |
| 96 | 11 | 50 | 1.62832E+03 | 8.00000E+03 | 3.75000E+00 |
| 97 | 33 | 38 | 4.24779E+03 | 6.03540E+03 | 3.75000E+00 |

***** SPECIFIED FLUX NODES *****

Number of flux nodes : 52

| No. | i | j | X [ft] | Y [ft] | nodal flow [ft^3/ft^2/d] |
|---|---|---|---|---|---|
| 1 | 56 | 28 | 8.00000E+03 | 4.40708E+03 | 0.00000E+00 |
| 2 | 56 | 27 | 8.00000E+03 | 4.24779E+03 | 0.00000E+00 |
| 3 | 56 | 26 | 8.00000E+03 | 4.08850E+03 | 0.00000E+00 |
| 4 | 56 | 25 | 8.00000E+03 | 3.91150E+03 | 0.00000E+00 |
| 5 | 56 | 24 | 8.00000E+03 | 3.75221E+03 | 0.00000E+00 |
| 6 | 56 | 23 | 8.00000E+03 | 3.59292E+03 | 0.00000E+00 |
| 7 | 56 | 22 | 8.00000E+03 | 3.43363E+03 | 0.00000E+00 |
| 8 | 56 | 21 | 8.00000E+03 | 3.25664E+03 | 0.00000E+00 |
| 9 | 56 | 20 | 8.00000E+03 | 3.09735E+03 | 0.00000E+00 |
| 10 | 56 | 19 | 8.00000E+03 | 2.93805E+03 | 0.00000E+00 |
| 11 | 56 | 18 | 8.00000E+03 | 2.77876E+03 | 0.00000E+00 |

| | | | | | |
|---|---|---|---|---|---|
| 12 | 56 | 17 | 8.00000E+03 | 2.61947E+03 | 0.00000E+00 |
| 13 | 56 | 16 | 8.00000E+03 | 2.44248E+03 | 0.00000E+00 |
| 14 | 56 | 15 | 8.00000E+03 | 2.28319E+03 | 0.00000E+00 |
| 15 | 56 | 14 | 8.00000E+03 | 2.12389E+03 | 0.00000E+00 |
| 16 | 56 | 13 | 8.00000E+03 | 1.96460E+03 | 0.00000E+00 |
| 17 | 56 | 12 | 8.00000E+03 | 1.78761E+03 | 0.00000E+00 |
| 18 | 56 | 11 | 8.00000E+03 | 1.62832E+03 | 0.00000E+00 |
| 19 | 56 | 10 | 8.00000E+03 | 1.46903E+03 | 0.00000E+00 |
| 20 | 56 | 9 | 8.00000E+03 | 1.30973E+03 | 0.00000E+00 |
| 21 | 56 | 8 | 8.00000E+03 | 1.15044E+03 | 0.00000E+00 |
| 22 | 56 | 7 | 8.00000E+03 | 9.73451E+02 | 0.00000E+00 |
| 23 | 56 | 6 | 8.00000E+03 | 8.14159E+02 | 0.00000E+00 |
| 24 | 56 | 5 | 8.00000E+03 | 6.54867E+02 | 0.00000E+00 |
| 25 | 56 | 4 | 8.00000E+03 | 4.95575E+02 | 0.00000E+00 |
| 26 | 56 | 3 | 8.00000E+03 | 3.18584E+02 | 0.00000E+00 |
| 27 | 56 | 2 | 8.00000E+03 | 1.59292E+02 | 0.00000E+00 |
| 28 | 1 | 25 | 0.00000E+00 | 3.91150E+03 | -6.70000E-01 |
| 29 | 1 | 24 | 0.00000E+00 | 3.75221E+03 | -6.70000E-01 |
| 30 | 1 | 23 | 0.00000E+00 | 3.59292E+03 | -6.70000E-01 |
| 31 | 1 | 22 | 0.00000E+00 | 3.43363E+03 | -6.70000E-01 |
| 32 | 1 | 21 | 0.00000E+00 | 3.25664E+03 | -6.70000E-01 |
| 33 | 1 | 20 | 0.00000E+00 | 3.09735E+03 | -6.70000E-01 |
| 34 | 1 | 19 | 0.00000E+00 | 2.93805E+03 | -6.70000E-01 |
| 35 | 1 | 18 | 0.00000E+00 | 2.77876E+03 | -6.70000E-01 |
| 36 | 1 | 17 | 0.00000E+00 | 2.61947E+03 | -6.70000E-01 |
| 37 | 1 | 16 | 0.00000E+00 | 2.44248E+03 | -6.70000E-01 |
| 38 | 1 | 15 | 0.00000E+00 | 2.28319E+03 | -6.70000E-01 |
| 39 | 1 | 14 | 0.00000E+00 | 2.12389E+03 | -6.70000E-01 |
| 40 | 1 | 13 | 0.00000E+00 | 1.96460E+03 | -6.70000E-01 |
| 41 | 1 | 12 | 0.00000E+00 | 1.78761E+03 | -6.70000E-01 |
| 42 | 1 | 11 | 0.00000E+00 | 1.62832E+03 | -6.70000E-01 |
| 43 | 1 | 10 | 0.00000E+00 | 1.46903E+03 | -6.70000E-01 |
| 44 | 1 | 9 | 0.00000E+00 | 1.30973E+03 | -6.70000E-01 |
| 45 | 1 | 8 | 0.00000E+00 | 1.15044E+03 | -6.70000E-01 |
| 46 | 1 | 7 | 0.00000E+00 | 9.73451E+02 | -6.70000E-01 |
| 47 | 1 | 6 | 0.00000E+00 | 8.14159E+02 | -6.70000E-01 |
| 48 | 1 | 5 | 0.00000E+00 | 6.54867E+02 | -6.70000E-01 |
| 49 | 1 | 4 | 0.00000E+00 | 4.95575E+02 | -6.70000E-01 |
| 50 | 1 | 3 | 0.00000E+00 | 3.18584E+02 | -6.70000E-01 |
| 51 | 1 | 2 | 0.00000E+00 | 1.59292E+02 | -6.70000E-01 |
| 52 | 1 | 1 | 0.00000E+00 | 0.00000E+00 | -6.70000E-01 |

***** SURFACE WATER BODIES *****

Number of surface water body nodes : 16

| No. | i | j | X [ft] | Y [ft] | water table [ft] | bottom elevation [ft] | leakage factor [ft/d] |
|---|---|---|---|---|---|---|---|
| 1 | 23 | 4 | 3.257E+03 | 4.956E+02 | 1.700E+01 | 1.600E+01 | 1.0000E-01 |
| 2 | 28 | 6 | 3.593E+03 | 8.142E+02 | 1.600E+01 | 1.500E+01 | 1.0000E-01 |
| 3 | 32 | 10 | 4.088E+03 | 1.469E+03 | 1.500E+01 | 1.400E+01 | 1.0000E-01 |
| 4 | 31 | 12 | 3.912E+03 | 1.788E+03 | 1.400E+01 | 1.300E+01 | 1.0000E-01 |
| 5 | 31 | 15 | 3.912E+03 | 2.283E+03 | 1.100E+01 | 1.000E+01 | 1.0000E-01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 30 | 17 | 3.752E+03 | 2.619E+03 | 8.000E+00 | 7.000E+00 | 1.0000E-01 |
| 7 | 29 | 19 | 3.681E+03 | 2.938E+03 | 7.000E+00 | 6.000E+00 | 1.0000E-01 |
| 8 | 27 | 22 | 3.522E+03 | 3.434E+03 | 6.500E+00 | 5.500E+00 | 1.0000E-01 |
| 9 | 26 | 25 | 3.434E+03 | 3.912E+03 | 6.000E+00 | 5.000E+00 | 1.0000E-01 |
| 10 | 23 | 27 | 3.257E+03 | 4.248E+03 | 4.600E+00 | 3.600E+00 | 1.0000E-01 |
| 11 | 18 | 30 | 2.726E+03 | 4.743E+03 | 4.200E+00 | 3.200E+00 | 1.0000E-01 |
| 12 | 19 | 35 | 2.779E+03 | 5.558E+03 | 4.000E+00 | 3.000E+00 | 1.0000E-01 |
| 13 | 23 | 37 | 3.257E+03 | 5.876E+03 | 3.800E+00 | 2.800E+00 | 1.0000E-01 |
| 14 | 21 | 33 | 2.991E+03 | 5.221E+03 | 4.100E+00 | 3.100E+00 | 1.0000E-01 |
| 15 | 21 | 29 | 2.991E+03 | 4.566E+03 | 4.300E+00 | 3.300E+00 | 1.0000E-01 |
| 16 | 21 | 36 | 2.991E+03 | 5.717E+03 | 3.900E+00 | 2.900E+00 | 1.0000E-01 |

***** AQUIFER PROPERTIES *****

Number of different material properties : 3

| No. | Kxx [ft/d] | Kyy [ft/d] | Porosity [-] | |
|---|---|---|---|---|
| 1 | 3.00000E+01 | 3.00000E+01 | 3.00000E-01 | (default) |
| 2 | 2.00000E+01 | 2.00000E+01 | 3.00000E-01 | |
| 3 | 1.00000E+01 | 1.00000E+01 | 3.00000E-01 | |

********** DISTRIBUTION OF AQUIFER MATERIAL PROPERTIES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 | 1 |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 | 1 |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 |
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 1 |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | 2 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 2 | 2 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | 2 | 2 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | 3 | 3 | 3 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 3 | 3 | 3 | 3 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | 1 | 3 | 3 | 3 | 3 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 46 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 44 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 43 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 42 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 18 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 17 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 16 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 14 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 13 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 12 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 11 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 10 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 9 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| 8 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 |
| 7 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 46 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 44 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 43 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 42 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|
| 50 | 1 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 |
| 46 | 1 | 1 | 1 | 1 | 1 |
| 45 | 1 | 1 | 1 | 1 | 1 |
| 44 | 1 | 1 | 1 | 1 | 1 |
| 43 | 1 | 1 | 1 | 1 | 1 |
| 42 | 1 | 1 | 1 | 1 | 1 |
| 41 | 1 | 1 | 1 | 1 | 1 |
| 40 | 1 | 1 | 1 | 1 | 1 |
| 39 | 1 | 1 | 1 | 1 | 1 |
| 38 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 |
| 28 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 |

| | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|
| 19 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |

***** AQUIFER TYPE *****

Unconfined aquifer

***** AQUIFER BOTTOM ELEVATIONS *****

Number of different aquifer bottom elevations : 3

| No. | aquifer bottom elevation [ft] |
|---|---|
| 1 | -1.00000E+01 (default) |
| 2 | -1.50000E+01 |
| 3 | -2.50000E+01 |

********** DISTRIBUTION OF AQUIFER BOTTOM ELEVATIONS **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 | 3 |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 | 3 |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 3 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 25 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| 50 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 47 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 46 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 44 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 43 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 42 | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 41 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 39 | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 38 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 37 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 36 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 48 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 47 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 46 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 45 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 44 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 43 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 42 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 41 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 39 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 38 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 36 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |

| | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|
| 50 | 3 | 3 | 3 | 3 | 3 |
| 49 | 3 | 3 | 3 | 3 | 3 |
| 48 | 3 | 3 | 3 | 3 | 3 |
| 47 | 3 | 3 | 3 | 3 | 3 |
| 46 | 3 | 3 | 3 | 3 | 3 |
| 45 | 3 | 3 | 3 | 3 | 3 |
| 44 | 3 | 3 | 3 | 3 | 3 |
| 43 | 3 | 3 | 3 | 3 | 3 |
| 42 | 3 | 3 | 3 | 3 | 3 |
| 41 | 3 | 3 | 3 | 3 | 3 |
| 40 | 3 | 3 | 3 | 3 | 3 |
| 39 | 3 | 3 | 3 | 3 | 3 |
| 38 | 3 | 3 | 3 | 3 | 3 |
| 37 | 3 | 3 | 3 | 3 | 3 |
| 36 | 3 | 3 | 3 | 3 | 3 |
| 35 | 3 | 3 | 3 | 3 | 3 |

| | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|
| 34 | 3 | 3 | 3 | 3 | 3 |
| 33 | 3 | 3 | 3 | 3 | 3 |
| 32 | 3 | 3 | 3 | 3 | 3 |
| 31 | 3 | 3 | 3 | 3 | 3 |
| 30 | 3 | 3 | 3 | 3 | 3 |
| 29 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 |
| 25 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |

***** AREAL RECHARGE *****

Number of different infiltration/evapotranspiration rates : 2

| No. | infiltration [L/T] | evapotranspiration [L/T] | effective recharge [L/T] | |
|---|---|---|---|---|
| 1 | 9.00000E-04 | 0.00000E+00 | 9.00000E-04 | (default) |
| 1 | 0.00000E+00 | 0.00000E+00 | 0.00000E+00 | |

********** DISTRIBUTION OF AREAL IN/OUT-FLUXES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 |
| 47 | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 |
| 46 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 | 2 |
| 45 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 | 2 |
| 44 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 |
| 43 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | 2 |
| 29 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 25 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 24 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 23 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 22 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| 21 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | * | * | 1 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | * | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | * | * | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | * | * | 1 | 1 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | * | * | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | * | * | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| 50 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 49 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 47 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 45 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 44 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 43 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 42 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 41 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 40 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 39 | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 24 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 23 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| 50 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 49 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 48 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 47 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 46 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 45 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 44 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 42 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 41 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 40 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 39 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 37 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 36 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 24 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 23 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 22 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 21 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 20 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 19 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 18 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 16 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 15 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 14 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 13 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 8 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|
| 50 | 2 | 2 | 2 | 2 | 2 |
| 49 | 2 | 2 | 2 | 2 | 2 |
| 48 | 2 | 2 | 2 | 2 | 2 |
| 47 | 2 | 2 | 2 | 2 | 2 |
| 46 | 2 | 2 | 2 | 2 | 2 |
| 45 | 2 | 2 | 2 | 2 | 2 |
| 44 | 2 | 2 | 2 | 2 | 2 |
| 43 | 2 | 2 | 2 | 2 | 2 |
| 42 | 2 | 2 | 2 | 2 | 2 |
| 41 | 2 | 2 | 2 | 2 | 2 |

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|---|---|---|---|---|---|
| 40 | 2 | 2 | 2 | 2 | 2 |
| 39 | 2 | 2 | 2 | 2 | 2 |
| 38 | 2 | 2 | 2 | 2 | 2 |
| 37 | 2 | 2 | 2 | 2 | 2 |
| 36 | 2 | 2 | 2 | 2 | 2 |
| 35 | 2 | 2 | 2 | 2 | 2 |
| 34 | 2 | 2 | 2 | 2 | 2 |
| 33 | 2 | 2 | 2 | 2 | 2 |
| 32 | 2 | 2 | 2 | 2 | 2 |
| 31 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 |
| 28 | 2 | 2 | 2 | 2 | 2 |
| 27 | 2 | 2 | 2 | 2 | 2 |
| 26 | 2 | 2 | 2 | 2 | 2 |
| 25 | 2 | 2 | 2 | 2 | 2 |
| 24 | 2 | 2 | 2 | 2 | 2 |
| 23 | 2 | 2 | 2 | 2 | 2 |
| 22 | 2 | 2 | 2 | 2 | 2 |
| 21 | 2 | 2 | 2 | 2 | 2 |
| 20 | 2 | 2 | 2 | 2 | 2 |
| 19 | 2 | 2 | 2 | 2 | 2 |
| 18 | 2 | 2 | 2 | 2 | 2 |
| 17 | 2 | 2 | 2 | 2 | 2 |
| 16 | 2 | 2 | 2 | 2 | 2 |
| 15 | 2 | 2 | 2 | 2 | 2 |
| 14 | 2 | 2 | 2 | 2 | 2 |
| 13 | 2 | 2 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 | 2 | 2 |
| 8 | 2 | 2 | 2 | 2 | 2 |
| 7 | 2 | 2 | 2 | 2 | 2 |
| 6 | 2 | 2 | 2 | 2 | 2 |
| 5 | 2 | 2 | 2 | 2 | 2 |
| 4 | 2 | 2 | 2 | 2 | 2 |
| 3 | 2 | 2 | 2 | 2 | 2 |
| 2 | 2 | 2 | 2 | 2 | 2 |
| 1 | 2 | 2 | 2 | 2 | 2 |
|  | 52 | 53 | 54 | 55 | 56 |

***** PATHLINE & PARTICLE TRACKING DATA *****

Number of forward particles : 5

| No. | x-release | y-release |
|---|---|---|
| 1 | 2.67076E+03 | 2.36735E+03 |
| 2 | 2.78779E+03 | 2.36735E+03 |
| 3 | 2.72711E+03 | 2.30233E+03 |
| 4 | 2.78779E+03 | 2.23298E+03 |
| 5 | 2.66643E+03 | 2.23298E+03 |

Number of reverse particles : 0

No well particles specified

************ HYDRAULIC HEAD DISTRIBUTION ************

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 50 | * | * | * | * | * | * |
| 49 | * | * | * | * | * | * |
| 48 | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * |
| 25 | 7.7162E+00 | 8.1731E+00 | * | * | * | * |
| 24 | 8.2048E+00 | 8.5823E+00 | * | * | * | * |
| 23 | 8.8401E+00 | 9.3047E+00 | 9.8165E+00 | * | * | * |
| 22 | 9.4474E+00 | 9.9074E+00 | 1.0282E+01 | * | * | * |
| 21 | 1.0040E+01 | 1.0530E+01 | 1.1060E+01 | 1.1793E+01 | 1.2177E+01 | * |
| 20 | 1.0559E+01 | 1.1050E+01 | 1.1559E+01 | 1.2093E+01 | 1.2523E+01 | 1.2906E+01 |
| 19 | 1.1010E+01 | 1.1495E+01 | 1.1975E+01 | 1.2444E+01 | 1.2868E+01 | 1.3254E+01 |
| 18 | 1.1411E+01 | 1.1890E+01 | 1.2353E+01 | 1.2794E+01 | 1.3204E+01 | 1.3584E+01 |
| 17 | 1.1776E+01 | 1.2251E+01 | 1.2703E+01 | 1.3129E+01 | 1.3528E+01 | 1.3898E+01 |
| 16 | 1.2115E+01 | 1.2587E+01 | 1.3032E+01 | 1.3448E+01 | 1.3837E+01 | 1.4197E+01 |
| 15 | 1.2434E+01 | 1.2904E+01 | 1.3344E+01 | 1.3753E+01 | 1.4132E+01 | 1.4483E+01 |
| 14 | 1.2739E+01 | 1.3207E+01 | 1.3642E+01 | 1.4045E+01 | 1.4416E+01 | 1.4757E+01 |
| 13 | 1.3032E+01 | 1.3500E+01 | 1.3931E+01 | 1.4327E+01 | 1.4690E+01 | 1.5021E+01 |
| 12 | 1.3319E+01 | 1.3785E+01 | 1.4212E+01 | 1.4602E+01 | 1.4957E+01 | 1.5279E+01 |
| 11 | 1.3602E+01 | 1.4067E+01 | 1.4490E+01 | 1.4873E+01 | 1.5219E+01 | 1.5531E+01 |
| 10 | 1.3884E+01 | 1.4347E+01 | 1.4766E+01 | 1.5142E+01 | 1.5479E+01 | 1.5780E+01 |
| 9 | 1.4169E+01 | 1.4631E+01 | 1.5044E+01 | 1.5411E+01 | 1.5738E+01 | 1.6026E+01 |
| 8 | 1.4461E+01 | 1.4921E+01 | 1.5327E+01 | 1.5685E+01 | 1.5998E+01 | 1.6272E+01 |
| 7 | 1.4765E+01 | 1.5222E+01 | 1.5620E+01 | 1.5965E+01 | 1.6262E+01 | 1.6518E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | 1.5087E+01 | 1.5540E+01 | 1.5927E+01 | 1.6255E+01 | 1.6532E+01 | 1.6766E+01 |
| 5 | 1.5433E+01 | 1.5882E+01 | 1.6255E+01 | 1.6561E+01 | 1.6810E+01 | 1.7016E+01 |
| 4 | 1.5812E+01 | 1.6259E+01 | 1.6612E+01 | 1.6886E+01 | 1.7099E+01 | 1.7268E+01 |
| 3 | 1.6226E+01 | 1.6688E+01 | 1.7011E+01 | 1.7235E+01 | 1.7397E+01 | 1.7521E+01 |
| 2 | 1.6645E+01 | 1.7214E+01 | 1.7469E+01 | 1.7610E+01 | 1.7702E+01 | 1.7768E+01 |
| 1 | 1.6855E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 |
| 50 | * | * | * | * | 3.7500E+00 | 3.7509E+00 |
| 49 | * | * | * | * | * | 3.7500E+00 |
| 48 | * | * | * | * | * | * |
| 47 | * | * | * | * | * | * |
| 46 | * | * | * | * | * | * |
| 45 | * | * | * | * | * | * |
| 44 | * | * | * | * | * | * |
| 43 | * | * | * | * | * | * |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * |
| 35 | * | * | * | * | * | * |
| 34 | * | * | * | * | * | * |
| 33 | * | * | * | * | * | * |
| 32 | * | * | * | * | * | * |
| 31 | * | * | * | * | * | * |
| 30 | * | * | * | * | * | * |
| 29 | * | * | * | * | * | * |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * |
| 25 | * | * | * | * | * | * |
| 24 | * | * | * | * | * | * |
| 23 | * | * | * | * | * | * |
| 22 | * | * | * | * | * | * |
| 21 | * | * | * | * | * | * |
| 20 | * | * | * | * | * | * |
| 19 | 1.3613E+01 | * | * | * | * | * |
| 18 | 1.3937E+01 | 1.4267E+01 | * | * | * | * |
| 17 | 1.4243E+01 | 1.4564E+01 | 1.4864E+01 | * | * | * |
| 16 | 1.4532E+01 | 1.4843E+01 | 1.5132E+01 | 1.5403E+01 | * | * |
| 15 | 1.4807E+01 | 1.5106E+01 | 1.5382E+01 | 1.5643E+01 | 1.5911E+01 | 1.6036E+01 |
| 14 | 1.5069E+01 | 1.5355E+01 | 1.5613E+01 | 1.5841E+01 | 1.6025E+01 | 1.6170E+01 |
| 13 | 1.5323E+01 | 1.5596E+01 | 1.5839E+01 | 1.6050E+01 | 1.6217E+01 | 1.6408E+01 |
| 12 | 1.5570E+01 | 1.5831E+01 | 1.6064E+01 | 1.6270E+01 | 1.6450E+01 | 1.6626E+01 |
| 11 | 1.5812E+01 | 1.6062E+01 | 1.6284E+01 | 1.6481E+01 | 1.6657E+01 | 1.6815E+01 |
| 10 | 1.6048E+01 | 1.6286E+01 | 1.6497E+01 | 1.6683E+01 | 1.6847E+01 | 1.6992E+01 |
| 9 | 1.6281E+01 | 1.6506E+01 | 1.6703E+01 | 1.6876E+01 | 1.7026E+01 | 1.7158E+01 |
| 8 | 1.6511E+01 | 1.6719E+01 | 1.6901E+01 | 1.7059E+01 | 1.7195E+01 | 1.7311E+01 |
| 7 | 1.6738E+01 | 1.6928E+01 | 1.7092E+01 | 1.7233E+01 | 1.7353E+01 | 1.7454E+01 |
| 6 | 1.6963E+01 | 1.7132E+01 | 1.7275E+01 | 1.7397E+01 | 1.7499E+01 | 1.7585E+01 |
| 5 | 1.7186E+01 | 1.7329E+01 | 1.7449E+01 | 1.7550E+01 | 1.7634E+01 | 1.7703E+01 |
| 4 | 1.7406E+01 | 1.7518E+01 | 1.7612E+01 | 1.7690E+01 | 1.7755E+01 | 1.7807E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 1.7618E+01 | 1.7697E+01 | 1.7761E+01 | 1.7814E+01 | 1.7858E+01 | 1.7893E+01 |
| 2 | 1.7819E+01 | 1.7859E+01 | 1.7892E+01 | 1.7919E+01 | 1.7941E+01 | 1.7959E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| | 13 | 14 | 15 | 16 | 17 | 18 |
| 50 | 3.7537E+00 | 3.7583E+00 | 3.7646E+00 | 3.7727E+00 | 3.7825E+00 | 3.7902E+00 |
| 49 | 3.7527E+00 | 3.7572E+00 | 3.7634E+00 | 3.7714E+00 | 3.7808E+00 | 3.7880E+00 |
| 48 | 3.7500E+00 | 3.7544E+00 | 3.7607E+00 | 3.7685E+00 | 3.7779E+00 | 3.7851E+00 |
| 47 | * | 3.7500E+00 | 3.7561E+00 | 3.7639E+00 | 3.7732E+00 | 3.7803E+00 |
| 46 | * | * | 3.7500E+00 | 3.7576E+00 | 3.7668E+00 | 3.7739E+00 |
| 45 | * | * | * | 3.7500E+00 | 3.7590E+00 | 3.7661E+00 |
| 44 | * | * | * | * | 3.7500E+00 | 3.7574E+00 |
| 43 | * | * | * | * | * | 3.7510E+00 |
| 42 | * | * | * | * | * | * |
| 41 | * | * | * | * | * | * |
| 40 | * | * | * | * | * | * |
| 39 | * | * | * | * | * | * |
| 38 | * | * | * | * | * | * |
| 37 | * | * | * | * | * | * |
| 36 | * | * | * | * | * | * |
| 35 | * | * | * | * | * | 4.0493E+00 |
| 34 | * | * | * | * | * | 4.1259E+00 |
| 33 | * | * | * | * | * | 4.1993E+00 |
| 32 | * | * | * | * | * | 4.2708E+00 |
| 31 | * | * | * | * | * | 4.3114E+00 |
| 30 | * | * | * | * | 4.2824E+00 | 4.2824E+00 |
| 29 | * | * | * | * | * | 4.3622E+00 |
| 28 | * | * | * | * | * | * |
| 27 | * | * | * | * | * | * |
| 26 | * | * | * | * | * | * |
| 25 | * | * | * | * | * | * |
| 24 | * | * | * | * | * | * |
| 23 | * | * | * | * | * | * |
| 22 | * | * | * | * | * | 1.1077E+01 |
| 21 | * | * | * | * | 1.1829E+01 | 1.1537E+01 |
| 20 | * | * | * | 1.2645E+01 | 1.2264E+01 | 1.1973E+01 |
| 19 | * | * | * | 1.2969E+01 | 1.2673E+01 | 1.2401E+01 |
| 18 | * | * | 1.4456E+01 | 1.3798E+01 | 1.3358E+01 | 1.3059E+01 |
| 17 | * | 1.5440E+01 | 1.5003E+01 | 1.4541E+01 | 1.4123E+01 | 1.3833E+01 |
| 16 | 1.5988E+01 | 1.5777E+01 | 1.5460E+01 | 1.5117E+01 | 1.4763E+01 | 1.4504E+01 |
| 15 | 1.6064E+01 | 1.6017E+01 | 1.5837E+01 | 1.5594E+01 | 1.5310E+01 | 1.5089E+01 |
| 14 | 1.6255E+01 | 1.6273E+01 | 1.6179E+01 | 1.6010E+01 | 1.5787E+01 | 1.5604E+01 |
| 13 | 1.6515E+01 | 1.6547E+01 | 1.6499E+01 | 1.6383E+01 | 1.6209E+01 | 1.6058E+01 |
| 12 | 1.6757E+01 | 1.6809E+01 | 1.6795E+01 | 1.6718E+01 | 1.6583E+01 | 1.6459E+01 |
| 11 | 1.6955E+01 | 1.7046E+01 | 1.7060E+01 | 1.7018E+01 | 1.6913E+01 | 1.6810E+01 |
| 10 | 1.7119E+01 | 1.7227E+01 | 1.7290E+01 | 1.7291E+01 | 1.7201E+01 | 1.7112E+01 |
| 9 | 1.7270E+01 | 1.7365E+01 | 1.7446E+01 | 1.7473E+01 | 1.7441E+01 | 1.7364E+01 |
| 8 | 1.7409E+01 | 1.7489E+01 | 1.7548E+01 | 1.7580E+01 | 1.7592E+01 | 1.7561E+01 |
| 7 | 1.7537E+01 | 1.7603E+01 | 1.7650E+01 | 1.7676E+01 | 1.7685E+01 | 1.7683E+01 |
| 6 | 1.7654E+01 | 1.7707E+01 | 1.7743E+01 | 1.7761E+01 | 1.7761E+01 | 1.7751E+01 |
| 5 | 1.7758E+01 | 1.7799E+01 | 1.7825E+01 | 1.7835E+01 | 1.7826E+01 | 1.7808E+01 |
| 4 | 1.7848E+01 | 1.7877E+01 | 1.7894E+01 | 1.7898E+01 | 1.7884E+01 | 1.7861E+01 |
| 3 | 1.7920E+01 | 1.7939E+01 | 1.7950E+01 | 1.7949E+01 | 1.7936E+01 | 1.7917E+01 |
| 2 | 1.7972E+01 | 1.7982E+01 | 1.7986E+01 | 1.7986E+01 | 1.7978E+01 | 1.7967E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.7997E+01 |

| | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|
| | 19 | 20 | 21 | 22 | 23 | 24 |
| 50 | 3.7937E+00 | 3.8056E+00 | 3.8096E+00 | 3.8181E+00 | 3.8320E+00 | 3.8409E+00 |
| 49 | 3.7914E+00 | 3.8029E+00 | 3.8068E+00 | 3.8153E+00 | 3.8283E+00 | 3.8362E+00 |
| 48 | 3.7885E+00 | 3.7999E+00 | 3.8038E+00 | 3.8122E+00 | 3.8252E+00 | 3.8331E+00 |
| 47 | 3.7836E+00 | 3.7949E+00 | 3.7987E+00 | 3.8070E+00 | 3.8196E+00 | 3.8273E+00 |
| 46 | 3.7772E+00 | 3.7884E+00 | 3.7921E+00 | 3.8002E+00 | 3.8126E+00 | 3.8201E+00 |
| 45 | 3.7693E+00 | 3.7804E+00 | 3.7840E+00 | 3.7920E+00 | 3.8041E+00 | 3.8114E+00 |
| 44 | 3.7604E+00 | 3.7712E+00 | 3.7748E+00 | 3.7826E+00 | 3.7943E+00 | 3.8014E+00 |
| 43 | 3.7500E+00 | 3.7609E+00 | 3.7646E+00 | 3.7723E+00 | 3.7837E+00 | 3.7904E+00 |
| 42 | * | 3.7500E+00 | 3.7548E+00 | 3.7616E+00 | 3.7724E+00 | 3.7789E+00 |
| 41 | * | * | * | 3.7500E+00 | 3.7610E+00 | 3.7675E+00 |
| 40 | * | * | * | * | 3.7500E+00 | 3.7582E+00 |
| 39 | * | * | * | * | * | 3.7632E+00 |
| 38 | * | * | * | * | 3.8413E+00 | 3.8319E+00 |
| 37 | * | * | * | 3.9069E+00 | 3.8610E+00 | 3.8858E+00 |
| 36 | * | 3.9739E+00 | 3.9566E+00 | 3.9744E+00 | 3.9821E+00 | 3.9961E+00 |
| 35 | 4.0376E+00 | 4.0556E+00 | 4.0611E+00 | 4.0794E+00 | 4.1110E+00 | 4.1323E+00 |
| 34 | 4.1264E+00 | 4.1378E+00 | 4.1460E+00 | 4.1782E+00 | 4.2340E+00 | 4.2676E+00 |
| 33 | 4.1996E+00 | 4.1984E+00 | 4.1872E+00 | 4.2662E+00 | 4.3554E+00 | 4.4042E+00 |
| 32 | 4.2755E+00 | 4.3099E+00 | 4.3282E+00 | 4.3856E+00 | 4.4851E+00 | 4.5462E+00 |
| 31 | 4.3220E+00 | 4.3860E+00 | 4.4141E+00 | 4.4858E+00 | 4.6103E+00 | 4.6883E+00 |
| 30 | 4.3236E+00 | 4.4262E+00 | 4.4630E+00 | 4.5625E+00 | 4.7261E+00 | 4.8285E+00 |
| 29 | 4.3744E+00 | 4.4471E+00 | 4.4474E+00 | 4.6174E+00 | 4.8299E+00 | 4.9673E+00 |
| 28 | * | 4.5765E+00 | 4.6038E+00 | 4.7141E+00 | 4.9093E+00 | 5.1062E+00 |
| 27 | * | * | * | 4.7698E+00 | 4.8165E+00 | 5.2582E+00 |
| 26 | * | * | * | * | * | 6.0125E+00 |
| 25 | * | * | * | * | 7.2636E+00 | 6.8383E+00 |
| 24 | * | * | * | 8.6661E+00 | 8.0568E+00 | 7.7326E+00 |
| 23 | * | 9.8917E+00 | 9.7642E+00 | 9.3050E+00 | 8.6541E+00 | 8.2809E+00 |
| 22 | 1.0997E+01 | 1.0425E+01 | 1.0238E+01 | 9.8119E+00 | 9.1173E+00 | 8.6174E+00 |
| 21 | 1.1402E+01 | 1.0888E+01 | 1.0708E+01 | 1.0304E+01 | 9.6535E+00 | 9.2422E+00 |
| 20 | 1.1836E+01 | 1.1340E+01 | 1.1166E+01 | 1.0774E+01 | 1.0140E+01 | 9.7395E+00 |
| 19 | 1.2268E+01 | 1.1784E+01 | 1.1613E+01 | 1.1225E+01 | 1.0583E+01 | 1.0148E+01 |
| 18 | 1.2922E+01 | 1.2445E+01 | 1.2278E+01 | 1.1899E+01 | 1.1269E+01 | 1.0838E+01 |
| 17 | 1.3701E+01 | 1.3247E+01 | 1.3089E+01 | 1.2731E+01 | 1.2132E+01 | 1.1714E+01 |
| 16 | 1.4385E+01 | 1.3970E+01 | 1.3826E+01 | 1.3501E+01 | 1.2962E+01 | 1.2597E+01 |
| 15 | 1.4986E+01 | 1.4620E+01 | 1.4493E+01 | 1.4205E+01 | 1.3735E+01 | 1.3426E+01 |
| 14 | 1.5516E+01 | 1.5201E+01 | 1.5090E+01 | 1.4841E+01 | 1.4435E+01 | 1.4173E+01 |
| 13 | 1.5985E+01 | 1.5716E+01 | 1.5620E+01 | 1.5405E+01 | 1.5054E+01 | 1.4829E+01 |
| 12 | 1.6398E+01 | 1.6168E+01 | 1.6086E+01 | 1.5898E+01 | 1.5592E+01 | 1.5395E+01 |
| 11 | 1.6758E+01 | 1.6560E+01 | 1.6488E+01 | 1.6324E+01 | 1.6055E+01 | 1.5880E+01 |
| 10 | 1.7067E+01 | 1.6894E+01 | 1.6830E+01 | 1.6684E+01 | 1.6443E+01 | 1.6287E+01 |
| 9 | 1.7324E+01 | 1.7171E+01 | 1.7114E+01 | 1.6981E+01 | 1.6759E+01 | 1.6615E+01 |
| 8 | 1.7526E+01 | 1.7393E+01 | 1.7341E+01 | 1.7216E+01 | 1.7002E+01 | 1.6863E+01 |
| 7 | 1.7670E+01 | 1.7572E+01 | 1.7521E+01 | 1.7396E+01 | 1.7178E+01 | 1.7031E+01 |
| 6 | 1.7745E+01 | 1.7695E+01 | 1.7660E+01 | 1.7527E+01 | 1.7299E+01 | 1.7142E+01 |
| 5 | 1.7796E+01 | 1.7741E+01 | 1.7719E+01 | 1.7608E+01 | 1.7374E+01 | 1.7280E+01 |
| 4 | 1.7846E+01 | 1.7773E+01 | 1.7734E+01 | 1.7616E+01 | 1.7300E+01 | 1.7380E+01 |
| 3 | 1.7905E+01 | 1.7849E+01 | 1.7823E+01 | 1.7758E+01 | 1.7643E+01 | 1.7626E+01 |
| 2 | 1.7960E+01 | 1.7931E+01 | 1.7919E+01 | 1.7891E+01 | 1.7845E+01 | 1.7827E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.7988E+01 | 1.8000E+01 | 1.8000E+01 | 1.7969E+01 |
| | 19 | 20 | 21 | 22 | 23 | 24 |

| | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|
| 50 | 3.8456E+00 | 3.8467E+00 | 3.8540E+00 | 3.8594E+00 | 3.8663E+00 | 3.8718E+00 |
| 49 | 3.8404E+00 | 3.8415E+00 | 3.8490E+00 | 3.8546E+00 | 3.8617E+00 | 3.8676E+00 |
| 48 | 3.8374E+00 | 3.8384E+00 | 3.8457E+00 | 3.8512E+00 | 3.8582E+00 | 3.8639E+00 |
| 47 | 3.8315E+00 | 3.8325E+00 | 3.8398E+00 | 3.8452E+00 | 3.8521E+00 | 3.8578E+00 |
| 46 | 3.8242E+00 | 3.8252E+00 | 3.8323E+00 | 3.8375E+00 | 3.8443E+00 | 3.8498E+00 |
| 45 | 3.8153E+00 | 3.8162E+00 | 3.8231E+00 | 3.8282E+00 | 3.8347E+00 | 3.8401E+00 |
| 44 | 3.8051E+00 | 3.8060E+00 | 3.8126E+00 | 3.8175E+00 | 3.8237E+00 | 3.8288E+00 |
| 43 | 3.7940E+00 | 3.7948E+00 | 3.8011E+00 | 3.8056E+00 | 3.8114E+00 | 3.8161E+00 |
| 42 | 3.7823E+00 | 3.7831E+00 | 3.7888E+00 | 3.7929E+00 | 3.7981E+00 | 3.8024E+00 |
| 41 | 3.7706E+00 | 3.7713E+00 | 3.7764E+00 | 3.7798E+00 | 3.7841E+00 | 3.7876E+00 |
| 40 | 3.7605E+00 | 3.7610E+00 | 3.7648E+00 | 3.7665E+00 | 3.7695E+00 | 3.7712E+00 |
| 39 | 3.7536E+00 | 3.7500E+00 | 3.7590E+00 | 3.7500E+00 | 3.7586E+00 | 3.7500E+00 |
| 38 | 3.8290E+00 | 3.8284E+00 | 3.8266E+00 | 3.8233E+00 | 3.8167E+00 | 3.8049E+00 |
| 37 | 3.8939E+00 | 3.8955E+00 | 3.9029E+00 | 3.9049E+00 | 3.9035E+00 | 3.8989E+00 |
| 36 | 4.0037E+00 | 4.0054E+00 | 4.0169E+00 | 4.0236E+00 | 4.0294E+00 | 4.0318E+00 |
| 35 | 4.1439E+00 | 4.1466E+00 | 4.1661E+00 | 4.1794E+00 | 4.1944E+00 | 4.2049E+00 |
| 34 | 4.2855E+00 | 4.2897E+00 | 4.3201E+00 | 4.3414E+00 | 4.3667E+00 | 4.3856E+00 |
| 33 | 4.4298E+00 | 4.4358E+00 | 4.4789E+00 | 4.5094E+00 | 4.5462E+00 | 4.5742E+00 |
| 32 | 4.5792E+00 | 4.5869E+00 | 4.6437E+00 | 4.6844E+00 | 4.7340E+00 | 4.7720E+00 |
| 31 | 4.7308E+00 | 4.7409E+00 | 4.8146E+00 | 4.8674E+00 | 4.9317E+00 | 4.9810E+00 |
| 30 | 4.8842E+00 | 4.8973E+00 | 4.9931E+00 | 5.0610E+00 | 5.1430E+00 | 5.2050E+00 |
| 29 | 5.0415E+00 | 5.0589E+00 | 5.1846E+00 | 5.2718E+00 | 5.3746E+00 | 5.4507E+00 |
| 28 | 5.2106E+00 | 5.2346E+00 | 5.4018E+00 | 5.5128E+00 | 5.6392E+00 | 5.7293E+00 |
| 27 | 5.4258E+00 | 5.4612E+00 | 5.6754E+00 | 5.8084E+00 | 5.9589E+00 | 6.0575E+00 |
| 26 | 6.0349E+00 | 6.0438E+00 | 6.1579E+00 | 6.2602E+00 | 6.3811E+00 | 6.4541E+00 |
| 25 | 6.5920E+00 | 6.5254E+00 | 6.7087E+00 | 6.8019E+00 | 6.8837E+00 | 6.9341E+00 |
| 24 | 7.5911E+00 | 7.5633E+00 | 7.4396E+00 | 7.4070E+00 | 7.4085E+00 | 7.4292E+00 |
| 23 | 8.0949E+00 | 8.0542E+00 | 7.8019E+00 | 7.7657E+00 | 7.7878E+00 | 7.8222E+00 |
| 22 | 8.2838E+00 | 8.1936E+00 | 7.3711E+00 | 7.7794E+00 | 8.0283E+00 | 8.1326E+00 |
| 21 | 9.0221E+00 | 8.9717E+00 | 8.6319E+00 | 8.5218E+00 | 8.4765E+00 | 8.4952E+00 |
| 20 | 9.5206E+00 | 9.4690E+00 | 9.0967E+00 | 8.8552E+00 | 8.6597E+00 | 8.6749E+00 |
| 19 | 9.8893E+00 | 9.8246E+00 | 9.3039E+00 | 8.8297E+00 | 8.0206E+00 | 8.5318E+00 |
| 18 | 1.0584E+01 | 1.0521E+01 | 1.0034E+01 | 9.6572E+00 | 9.2177E+00 | 9.0850E+00 |
| 17 | 1.1460E+01 | 1.1396E+01 | 1.0876E+01 | 1.0401E+01 | 9.6003E+00 | 8.5878E+00 |
| 16 | 1.2384E+01 | 1.2331E+01 | 1.1924E+01 | 1.1602E+01 | 1.1186E+01 | 1.0904E+01 |
| 15 | 1.3248E+01 | 1.3205E+01 | 1.2876E+01 | 1.2620E+01 | 1.2282E+01 | 1.1993E+01 |
| 14 | 1.4025E+01 | 1.3989E+01 | 1.3719E+01 | 1.3514E+01 | 1.3252E+01 | 1.3045E+01 |
| 13 | 1.4702E+01 | 1.4671E+01 | 1.4440E+01 | 1.4265E+01 | 1.4040E+01 | 1.3858E+01 |
| 12 | 1.5284E+01 | 1.5257E+01 | 1.5052E+01 | 1.4895E+01 | 1.4684E+01 | 1.4502E+01 |
| 11 | 1.5782E+01 | 1.5758E+01 | 1.5577E+01 | 1.5437E+01 | 1.5252E+01 | 1.5094E+01 |
| 10 | 1.6199E+01 | 1.6178E+01 | 1.6017E+01 | 1.5894E+01 | 1.5733E+01 | 1.5595E+01 |
| 9 | 1.6535E+01 | 1.6516E+01 | 1.6372E+01 | 1.6265E+01 | 1.6128E+01 | 1.6017E+01 |
| 8 | 1.6785E+01 | 1.6767E+01 | 1.6629E+01 | 1.6532E+01 | 1.6419E+01 | 1.6332E+01 |
| 7 | 1.6945E+01 | 1.6925E+01 | 1.6767E+01 | 1.6663E+01 | 1.6594E+01 | 1.6553E+01 |
| 6 | 1.7039E+01 | 1.7012E+01 | 1.6754E+01 | 1.6526E+01 | 1.6678E+01 | 1.6723E+01 |
| 5 | 1.7214E+01 | 1.7203E+01 | 1.7135E+01 | 1.7068E+01 | 1.7041E+01 | 1.7028E+01 |
| 4 | 1.7389E+01 | 1.7388E+01 | 1.7371E+01 | 1.7351E+01 | 1.7329E+01 | 1.7313E+01 |
| 3 | 1.7619E+01 | 1.7617E+01 | 1.7604E+01 | 1.7593E+01 | 1.7578E+01 | 1.7567E+01 |
| 2 | 1.7821E+01 | 1.7820E+01 | 1.7809E+01 | 1.7805E+01 | 1.7796E+01 | 1.7794E+01 |
| 1 | 1.7990E+01 | 1.8000E+01 | 1.7965E+01 | 1.8000E+01 | 1.7962E+01 | 1.8000E+01 |
| | 25 | 26 | 27 | 28 | 29 | 30 |

| | 31 | 32 | 33 | 34 | 35 | 36 |
|---|---|---|---|---|---|---|
| 50 | 3.8838E+00 | 3.8972E+00 | 3.9113E+00 | 3.9259E+00 | 3.9411E+00 | 3.9567E+00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 49 | 3.8803E+00 | 3.8937E+00 | 3.9077E+00 | 3.9221E+00 | 3.9370E+00 | 3.9523E+00 |
| 48 | 3.8764E+00 | 3.8897E+00 | 3.9035E+00 | 3.9178E+00 | 3.9325E+00 | 3.9476E+00 |
| 47 | 3.8702E+00 | 3.8833E+00 | 3.8968E+00 | 3.9108E+00 | 3.9252E+00 | 3.9399E+00 |
| 46 | 3.8620E+00 | 3 8747E+00 | 3.8878E+00 | 3.9013E+00 | 3.9152E+00 | 3.9295E+00 |
| 45 | 3.8518E+00 | 3.8640E+00 | 3.8766E+00 | 3.8895E+00 | 3.9029E+00 | 3.9165E+00 |
| 44 | 3.8399E+00 | 3.8515E+00 | 3.8634E+00 | 3.8756E+00 | 3.8882E+00 | 3.9011E+00 |
| 43 | 3.8265E+00 | 3.8373E+00 | 3.8484E+00 | 3.8598E+00 | 3.8715E+00 | 3.8835E+00 |
| 42 | 3.8118E+00 | 3.8216E+00 | 3.8317E+00 | 3.8422E+00 | 3.8530E+00 | 3.8639E+00 |
| 41 | 3.7959E+00 | 3.8046E+00 | 3.8137E+00 | 3.8233E+00 | 3.8329E+00 | 3.8426E+00 |
| 40 | 3.7789E+00 | 3.7866E+00 | 3.7944E+00 | 3.8032E+00 | 3.8118E+00 | 3.8201E+00 |
| 39 | 3.7617E+00 | 3.7679E+00 | 3.7736E+00 | 3.7825E+00 | 3.7901E+00 | 3.7966E+00 |
| 38 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7628E+00 | 3.7689E+00 | 3.7729E+00 |
| 37 | 3.8785E+00 | 3.8634E+00 | 3.8332E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 |
| 36 | 4.0297E+00 | 4.0216E+00 | 4.0006E+00 | 3.9621E+00 | 3.9443E+00 | 3.9346E+00 |
| 35 | 4.2212E+00 | 4.2281E+00 | 4.2231E+00 | 4.2052E+00 | 4.1763E+00 | 4.1602E+00 |
| 34 | 4.4203E+00 | 4.4440E+00 | 4.4559E+00 | 4.4559E+00 | 4.4469E+00 | 4.4349E+00 |
| 33 | 4.6282E+00 | 4.6695E+00 | 4.6975E+00 | 4.7126E+00 | 4.7165E+00 | 4.7111E+00 |
| 32 | 4.8464E+00 | 4.9054E+00 | 4.9488E+00 | 4.9772E+00 | 4.9917E+00 | 4.9932E+00 |
| 31 | 5.0771E+00 | 5.1540E+00 | 5.2119E+00 | 5.2521E+00 | 5.2759E+00 | 5.2843E+00 |
| 30 | 5.3241E+00 | 5.4181E+00 | 5.4890E+00 | 5.5394E+00 | 5.5713E+00 | 5.5862E+00 |
| 29 | 5.5924E+00 | 5.7012E+00 | 5.7826E+00 | 5.8410E+00 | 5.8795E+00 | 5.8999E+00 |
| 28 | 5.8888E+00 | 6.0072E+00 | 6.0947E+00 | 6.1579E+00 | 6.2010E+00 | 6.2260E+00 |
| 27 | 6.2207E+00 | 6.3389E+00 | 6.4258E+00 | 6.4899E+00 | 6.5354E+00 | 6.5640E+00 |
| 26 | 6.5909E+00 | 6.6961E+00 | 6.7741E+00 | 6.8352E+00 | 6.8815E+00 | 6.9130E+00 |
| 25 | 7.0387E+00 | 7.1250E+00 | 7.1818E+00 | 7.2373E+00 | 7.2843E+00 | 7.3195E+00 |
| 24 | 7.5075E+00 | 7.5843E+00 | 7.6362E+00 | 7.6923E+00 | 7.7433E+00 | 7.7841E+00 |
| 23 | 7.9207E+00 | 8.0116E+00 | 8.0750E+00 | 8.1410E+00 | 8.2007E+00 | 8.2494E+00 |
| 22 | 8.2879E+00 | 8.4122E+00 | 8.5006E+00 | 8.5848E+00 | 8.6577E+00 | 8.7162E+00 |
| 21 | 8.6345E+00 | 8.7965E+00 | 8.9205E+00 | 9.0291E+00 | 9.1178E+00 | 9.1866E+00 |
| 20 | 8.9092E+00 | 9.1677E+00 | 9.3457E+00 | 9.4825E+00 | 9.5862E+00 | 9.6635E+00 |
| 19 | 9.1113E+00 | 9.5675E+00 | 9.8009E+00 | 9.9573E+00 | 1.0069E+01 | 1.0150E+01 |
| 18 | 9.6403E+00 | 1.0130E+01 | 1.0319E+01 | 1.0464E+01 | 1.0571E+01 | 1.0648E+01 |
| 17 | 1.0099E+01 | 1.0691E+01 | 1.0866E+01 | 1.0995E+01 | 1.1088E+01 | 1.1156E+01 |
| 16 | 1.0967E+01 | 1.1310E+01 | 1.1444E+01 | 1.1546E+01 | 1.1619E+01 | 1.1671E+01 |
| 15 | 1.1244E+01 | 1.1911E+01 | 1.2038E+01 | 1.2111E+01 | 1.2159E+01 | 1.2191E+01 |
| 14 | 1.2650E+01 | 1.2655E+01 | 1.2669E+01 | 1.2686E+01 | 1.2700E+01 | 1.2709E+01 |
| 13 | 1.3484E+01 | 1.3330E+01 | 1.3279E+01 | 1.3252E+01 | 1.3234E+01 | 1.3220E+01 |
| 12 | 1.4047E+01 | 1.3928E+01 | 1.3851E+01 | 1.3794E+01 | 1.3751E+01 | 1.3718E+01 |
| 11 | 1.4727E+01 | 1.4496E+01 | 1.4390E+01 | 1.4309E+01 | 1.4248E+01 | 1.4200E+01 |
| 10 | 1.5272E+01 | 1.5009E+01 | 1.4892E+01 | 1.4796E+01 | 1.4721E+01 | 1.4662E+01 |
| 9 | 1.5777E+01 | 1.5500E+01 | 1.5361E+01 | 1.5253E+01 | 1.5169E+01 | 1.5103E+01 |
| 8 | 1.6161E+01 | 1.5949E+01 | 1.5792E+01 | 1.5678E+01 | 1.5591E+01 | 1.5523E+01 |
| 7 | 1.6439E+01 | 1.6304E+01 | 1.6172E+01 | 1.6068E+01 | 1.5987E+01 | 1.5922E+01 |
| 6 | 1.6702E+01 | 1.6622E+01 | 1.6518E+01 | 1.6431E+01 | 1.6359E+01 | 1.6302E+01 |
| 5 | 1.6991E+01 | 1.6928E+01 | 1.6844E+01 | 1.6773E+01 | 1.6713E+01 | 1.6665E+01 |
| 4 | 1.7274E+01 | 1.7223E+01 | 1.7154E+01 | 1.7098E+01 | 1.7051E+01 | 1.7013E+01 |
| 3 | 1.7539E+01 | 1.7501E+01 | 1.7449E+01 | 1.7409E+01 | 1.7376E+01 | 1.7350E+01 |
| 2 | 1.7781E+01 | 1.7761E+01 | 1.7730E+01 | 1.7709E+01 | 1.7692E+01 | 1.7678E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 31 | 32 | 33 | 34 | 35 | 36 |

| | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|
| 50 | 3.9726E+00 | 3.9888E+00 | 4.0053E+00 | 4.0218E+00 | 4.0384E+00 | 4.0550E+00 |
| 49 | 3.9680E+00 | 3.9839E+00 | 4.0001E+00 | 4.0164E+00 | 4.0327E+00 | 4.0490E+00 |
| 48 | 3.9630E+00 | 3.9788E+00 | 3.9947E+00 | 4.0108E+00 | 4.0270E+00 | 4.0431E+00 |
| 47 | 3.9550E+00 | 3.9704E+00 | 3.9860E+00 | 4.0018E+00 | 4.0177E+00 | 4.0335E+00 |

| | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|
| 46 | 3.9441E+00 | 3.9591E+00 | 3.9742E+00 | 3.9896E+00 | 4.0051E+00 | 4.0206E+00 |
| 45 | 3.9305E+00 | 3.9448E+00 | 3.9594E+00 | 3.9742E+00 | 3.9892E+00 | 4.0043E+00 |
| 44 | 3.9144E+00 | 3.9279E+00 | 3.9418E+00 | 3.9559E+00 | 3.9703E+00 | 3.9849E+00 |
| 43 | 3.8958E+00 | 3.9084E+00 | 3.9214E+00 | 3.9348E+00 | 3.9485E+00 | 3.9625E+00 |
| 42 | 3.8751E+00 | 3.8866E+00 | 3.8986E+00 | 3.9110E+00 | 3.9239E+00 | 3.9372E+00 |
| 41 | 3.8525E+00 | 3.8627E+00 | 3.8734E+00 | 3.8847E+00 | 3.8968E+00 | 3.9094E+00 |
| 40 | 3.8283E+00 | 3.8368E+00 | 3.8459E+00 | 3.8561E+00 | 3.8673E+00 | 3.8792E+00 |
| 39 | 3.8028E+00 | 3.8091E+00 | 3.8162E+00 | 3.8248E+00 | 3.8358E+00 | 3.8471E+00 |
| 38 | 3.7763E+00 | 3.7797E+00 | 3.7839E+00 | 3.7902E+00 | 3.8027E+00 | 3.8136E+00 |
| 37 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7707E+00 | 3.7802E+00 |
| 36 | 3.9254E+00 | 3.9128E+00 | 3.8914E+00 | 3.8491E+00 | 3.7500E+00 | 3.7500E+00 |
| 35 | 4.1446E+00 | 4.1233E+00 | 4.0908E+00 | 4.0404E+00 | 3.9690E+00 | 3.9279E+00 |
| 34 | 4.4176E+00 | 4.3913E+00 | 4.3520E+00 | 4.2950E+00 | 4.2161E+00 | 4.1291E+00 |
| 33 | 4.6958E+00 | 4.6687E+00 | 4.6270E+00 | 4.5677E+00 | 4.4878E+00 | 4.3831E+00 |
| 32 | 4.9818E+00 | 4.9564E+00 | 4.9154E+00 | 4.8570E+00 | 4.7796E+00 | 4.6837E+00 |
| 31 | 5.2776E+00 | 5.2555E+00 | 5.2168E+00 | 5.1605E+00 | 5.0852E+00 | 4.9904E+00 |
| 30 | 5.5845E+00 | 5.5664E+00 | 5.5312E+00 | 5.4779E+00 | 5.4053E+00 | 5.3115E+00 |
| 29 | 5.9033E+00 | 5.8896E+00 | 5.8587E+00 | 5.8095E+00 | 5.7408E+00 | 5.6506E+00 |
| 28 | 6.2340E+00 | 6.2251E+00 | 6.1990E+00 | 6.1549E+00 | 6.0919E+00 | 6.0080E+00 |
| 27 | 6.5763E+00 | 6.5723E+00 | 6.5516E+00 | 6.5136E+00 | 6.4574E+00 | 6.3820E+00 |
| 26 | 6.9295E+00 | 6.9305E+00 | 6.9156E+00 | 6.8842E+00 | 6.8358E+00 | 6.7698E+00 |
| 25 | 7.3410E+00 | 7.3480E+00 | 7.3399E+00 | 7.3164E+00 | 7.2772E+00 | 7.2223E+00 |
| 24 | 7.8121E+00 | 7.8262E+00 | 7.8258E+00 | 7.8110E+00 | 7.7819E+00 | 7.7389E+00 |
| 23 | 8.2848E+00 | 8.3060E+00 | 8.3130E+00 | 8.3062E+00 | 8.2863E+00 | 8.2539E+00 |
| 22 | 8.7594E+00 | 8.7875E+00 | 8.8012E+00 | 8.8014E+00 | 8.7893E+00 | 8.7659E+00 |
| 21 | 9.2371E+00 | 9.2710E+00 | 9.2902E+00 | 9.2961E+00 | 9.2903E+00 | 9.2741E+00 |
| 20 | 9.7194E+00 | 9.7574E+00 | 9.7802E+00 | 9.7901E+00 | 9.7889E+00 | 9.7782E+00 |
| 19 | 1.0208E+01 | 1.0247E+01 | 1.0271E+01 | 1.0283E+01 | 1.0285E+01 | 1.0278E+01 |
| 18 | 1.0702E+01 | 1.0740E+01 | 1.0763E+01 | 1.0775E+01 | 1.0777E+01 | 1.0772E+01 |
| 17 | 1.1203E+01 | 1.1235E+01 | 1.1254E+01 | 1.1264E+01 | 1.1266E+01 | 1.1261E+01 |
| 16 | 1.1707E+01 | 1.1730E+01 | 1.1744E+01 | 1.1750E+01 | 1.1750E+01 | 1.1745E+01 |
| 15 | 1.2212E+01 | 1.2225E+01 | 1.2231E+01 | 1.2232E+01 | 1.2228E+01 | 1.2222E+01 |
| 14 | 1.2714E+01 | 1.2715E+01 | 1.2713E+01 | 1.2708E+01 | 1.2700E+01 | 1.2691E+01 |
| 13 | 1.3209E+01 | 1.3198E+01 | 1.3187E+01 | 1.3176E+01 | 1.3165E+01 | 1.3153E+01 |
| 12 | 1.3692E+01 | 1.3671E+01 | 1.3652E+01 | 1.3636E+01 | 1.3621E+01 | 1.3607E+01 |
| 11 | 1.4162E+01 | 1.4132E+01 | 1.4107E+01 | 1.4086E+01 | 1.4067E+01 | 1.4051E+01 |
| 10 | 1.4616E+01 | 1.4579E+01 | 1.4549E+01 | 1.4524E+01 | 1.4504E+01 | 1.4486E+01 |
| 9 | 1.5052E+01 | 1.5011E+01 | 1.4978E+01 | 1.4952E+01 | 1.4930E+01 | 1.4911E+01 |
| 8 | 1.5470E+01 | 1.5428E+01 | 1.5395E+01 | 1.5367E+01 | 1.5345E+01 | 1.5327E+01 |
| 7 | 1.5871E+01 | 1.5831E+01 | 1.5798E+01 | 1.5772E+01 | 1.5750E+01 | 1.5733E+01 |
| 6 | 1.6256E+01 | 1.6219E+01 | 1.6189E+01 | 1.6165E+01 | 1.6146E+01 | 1.6130E+01 |
| 5 | 1.6625E+01 | 1.6594E+01 | 1.6569E+01 | 1.6548E+01 | 1.6531E+01 | 1.6518E+01 |
| 4 | 1.6983E+01 | 1.6958E+01 | 1.6938E+01 | 1.6922E+01 | 1.6909E+01 | 1.6898E+01 |
| 3 | 1.7329E+01 | 1.7312E+01 | 1.7299E+01 | 1.7288E+01 | 1.7279E+01 | 1.7272E+01 |
| 2 | 1.7668E+01 | 1.7659E+01 | 1.7652E+01 | 1.7647E+01 | 1.7642E+01 | 1.7639E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |

| | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|
| 50 | 4.0714E+00 | 4.0875E+00 | 4.1031E+00 | 4.1182E+00 | 4.1327E+00 | 4.1462E+00 |
| 49 | 4.0651E+00 | 4.0810E+00 | 4.0964E+00 | 4.1113E+00 | 4.1255E+00 | 4.1389E+00 |
| 48 | 4.0591E+00 | 4.0748E+00 | 4.0901E+00 | 4.1049E+00 | 4.1191E+00 | 4.1325E+00 |
| 47 | 4.0493E+00 | 4.0648E+00 | 4.0800E+00 | 4.0947E+00 | 4.1088E+00 | 4.1221E+00 |
| 46 | 4.0360E+00 | 4.0513E+00 | 4.0663E+00 | 4.0808E+00 | 4.0948E+00 | 4.1080E+00 |
| 45 | 4.0194E+00 | 4.0344E+00 | 4.0491E+00 | 4.0634E+00 | 4.0773E+00 | 4.0905E+00 |
| 44 | 3.9995E+00 | 4.0141E+00 | 4.0286E+00 | 4.0427E+00 | 4.0564E+00 | 4.0696E+00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 43 | 3.9766E+00 | 3.9908E+00 | 4.0049E+00 | 4.0188E+00 | 4.0324E+00 | 4.0455E+00 |
| 42 | 3.9508E+00 | 3.9645E+00 | 3.9782E+00 | 3.9919E+00 | 4.0053E+00 | 4.0184E+00 |
| 41 | 3.9223E+00 | 3.9355E+00 | 3.9488E+00 | 3.9622E+00 | 3.9754E+00 | 3.9885E+00 |
| 40 | 3.8914E+00 | 3.9039E+00 | 3.9168E+00 | 3.9299E+00 | 3.9430E+00 | 3.9561E+00 |
| 39 | 3.8584E+00 | 3.8702E+00 | 3.8826E+00 | 3.8953E+00 | 3.9081E+00 | 3.9211E+00 |
| 38 | 3.8236E+00 | 3.8341E+00 | 3.8464E+00 | 3.8588E+00 | 3.8709E+00 | 3.8835E+00 |
| 37 | 3.7871E+00 | 3.7949E+00 | 3.8089E+00 | 3.8210E+00 | 3.8317E+00 | 3.8429E+00 |
| 36 | 3.7500E+00 | 3.7500E+00 | 3.7731E+00 | 3.7836E+00 | 3.7908E+00 | 3.7983E+00 |
| 35 | 3.8702E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 |
| 34 | 4.0516E+00 | 3.9632E+00 | 3.9059E+00 | 3.8564E+00 | 3.8097E+00 | 3.7729E+00 |
| 33 | 4.2866E+00 | 4.1859E+00 | 4.0875E+00 | 3.9836E+00 | 3.8712E+00 | 3.7818E+00 |
| 32 | 4.5765E+00 | 4.4547E+00 | 4.3147E+00 | 4.1477E+00 | 3.9446E+00 | 3.7500E+00 |
| 31 | 4.8758E+00 | 4.7369E+00 | 4.5648E+00 | 4.3443E+00 | 4.0533E+00 | 3.7500E+00 |
| 30 | 5.1940E+00 | 5.0465E+00 | 4.8577E+00 | 4.6051E+00 | 4.2402E+00 | 3.7500E+00 |
| 29 | 5.5358E+00 | 5.3909E+00 | 5.2067E+00 | 4.9683E+00 | 4.6528E+00 | 4.2345E+00 |
| 28 | 5.9009E+00 | 5.7669E+00 | 5.6008E+00 | 5.3966E+00 | 5.1507E+00 | 4.8721E+00 |
| 27 | 6.2857E+00 | 6.1667E+00 | 6.0232E+00 | 5.8548E+00 | 5.6651E+00 | 5.4675E+00 |
| 26 | 6.6855E+00 | 6.5824E+00 | 6.4608E+00 | 6.3225E+00 | 6.1730E+00 | 6.0230E+00 |
| 25 | 7.1516E+00 | 7.0657E+00 | 6.9658E+00 | 6.8545E+00 | 6.7368E+00 | 6.6203E+00 |
| 24 | 7.6827E+00 | 7.6142E+00 | 7.5351E+00 | 7.4483E+00 | 7.3575E+00 | 7.2681E+00 |
| 23 | 8.2101E+00 | 8.1561E+00 | 8.0940E+00 | 8.0259E+00 | 7.9552E+00 | 7.8854E+00 |
| 22 | 8.7324E+00 | 8.6904E+00 | 8.6416E+00 | 8.5882E+00 | 8.5325E+00 | 8.4773E+00 |
| 21 | 9.2490E+00 | 9.2165E+00 | 9.1782E+00 | 9.1360E+00 | 9.0919E+00 | 9.0479E+00 |
| 20 | 9.7595E+00 | 9.7343E+00 | 9.7041E+00 | 9.6706E+00 | 9.6353E+00 | 9.6000E+00 |
| 19 | 1.0264E+01 | 1.0244E+01 | 1.0220E+01 | 1.0193E+01 | 1.0164E+01 | 1.0136E+01 |
| 18 | 1.0761E+01 | 1.0745E+01 | 1.0726E+01 | 1.0704E+01 | 1.0680E+01 | 1.0657E+01 |
| 17 | 1.1252E+01 | 1.1238E+01 | 1.1222E+01 | 1.1204E+01 | 1.1184E+01 | 1.1164E+01 |
| 16 | 1.1736E+01 | 1.1724E+01 | 1.1709E+01 | 1.1693E+01 | 1.1677E+01 | 1.1660E+01 |
| 15 | 1.2212E+01 | 1.2200E+01 | 1.2187E+01 | 1.2173E+01 | 1.2158E+01 | 1.2144E+01 |
| 14 | 1.2681E+01 | 1.2669E+01 | 1.2656E+01 | 1.2643E+01 | 1.2630E+01 | 1.2617E+01 |
| 13 | 1.3141E+01 | 1.3129E+01 | 1.3117E+01 | 1.3104E+01 | 1.3092E+01 | 1.3080E+01 |
| 12 | 1.3593E+01 | 1.3580E+01 | 1.3568E+01 | 1.3556E+01 | 1.3545E+01 | 1.3534E+01 |
| 11 | 1.4036E+01 | 1.4023E+01 | 1.4010E+01 | 1.3999E+01 | 1.3988E+01 | 1.3978E+01 |
| 10 | 1.4470E+01 | 1.4457E+01 | 1.4444E+01 | 1.4433E+01 | 1.4423E+01 | 1.4414E+01 |
| 9 | 1.4895E+01 | 1.4881E+01 | 1.4869E+01 | 1.4859E+01 | 1.4849E+01 | 1.4841E+01 |
| 8 | 1.5311E+01 | 1.5298E+01 | 1.5286E+01 | 1.5276E+01 | 1.5268E+01 | 1.5260E+01 |
| 7 | 1.5718E+01 | 1.5706E+01 | 1.5695E+01 | 1.5686E+01 | 1.5678E+01 | 1.5671E+01 |
| 6 | 1.6116E+01 | 1.6105E+01 | 1.6096E+01 | 1.6088E+01 | 1.6081E+01 | 1.6075E+01 |
| 5 | 1.6507E+01 | 1.6497E+01 | 1.6489E+01 | 1.6483E+01 | 1.6477E+01 | 1.6472E+01 |
| 4 | 1.6889E+01 | 1.6882E+01 | 1.6876E+01 | 1.6871E+01 | 1.6867E+01 | 1.6863E+01 |
| 3 | 1.7266E+01 | 1.7261E+01 | 1.7256E+01 | 1.7253E+01 | 1.7250E+01 | 1.7248E+01 |
| 2 | 1.7635E+01 | 1.7633E+01 | 1.7631E+01 | 1.7629E+01 | 1.7628E+01 | 1.7626E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 43 | 44 | 45 | 46 | 47 | 48 |

| | 49 | 50 | 51 | 52 | 53 | 54 |
|---|---|---|---|---|---|---|
| 50 | 4.1588E+00 | 4.1703E+00 | 4.1804E+00 | 4.1892E+00 | 4.1965E+00 | 4.2023E+00 |
| 49 | 4.1513E+00 | 4.1626E+00 | 4.1727E+00 | 4.1813E+00 | 4.1884E+00 | 4.1940E+00 |
| 48 | 4.1448E+00 | 4.1561E+00 | 4.1661E+00 | 4.1748E+00 | 4.1819E+00 | 4.1875E+00 |
| 47 | 4.1344E+00 | 4.1457E+00 | 4.1557E+00 | 4.1644E+00 | 4.1715E+00 | 4.1771E+00 |
| 46 | 4.1204E+00 | 4.1317E+00 | 4.1417E+00 | 4.1504E+00 | 4.1576E+00 | 4.1632E+00 |
| 45 | 4.1028E+00 | 4.1141E+00 | 4.1243E+00 | 4.1330E+00 | 4.1403E+00 | 4.1459E+00 |
| 44 | 4.0819E+00 | 4.0933E+00 | 4.1036E+00 | 4.1125E+00 | 4.1199E+00 | 4.1255E+00 |
| 43 | 4.0579E+00 | 4.0695E+00 | 4.0799E+00 | 4.0890E+00 | 4.0966E+00 | 4.1024E+00 |
| 42 | 4.0310E+00 | 4.0428E+00 | 4.0535E+00 | 4.0630E+00 | 4.0708E+00 | 4.0769E+00 |
| 41 | 4.0013E+00 | 4.0135E+00 | 4.0247E+00 | 4.0347E+00 | 4.0430E+00 | 4.0493E+00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 40 | 3.9691E+00 | 3.9819E+00 | 3.9939E+00 | 4.0045E+00 | 4.0134E+00 | 4.0202E+00 |
| 39 | 3.9345E+00 | 3.9482E+00 | 3.9613E+00 | 3.9730E+00 | 3.9827E+00 | 3.9901E+00 |
| 38 | 3.8973E+00 | 3.9125E+00 | 3.9275E+00 | 3.9407E+00 | 3.9516E+00 | 3.9596E+00 |
| 37 | 3.8567E+00 | 3.8750E+00 | 3.8931E+00 | 3.9085E+00 | 3.9207E+00 | 3.9295E+00 |
| 36 | 3.8101E+00 | 3.8361E+00 | 3.8594E+00 | 3.8775E+00 | 3.8911E+00 | 3.9005E+00 |
| 35 | 3.7500E+00 | 3.7996E+00 | 3.8294E+00 | 3.8496E+00 | 3.8638E+00 | 3.8734E+00 |
| 34 | 3.7500E+00 | 3.7828E+00 | 3.8079E+00 | 3.8264E+00 | 3.8396E+00 | 3.8486E+00 |
| 33 | 3.7500E+00 | 3.7734E+00 | 3.7925E+00 | 3.8075E+00 | 3.8186E+00 | 3.8263E+00 |
| 32 | 3.7557E+00 | 3.7681E+00 | 3.7808E+00 | 3.7917E+00 | 3.8002E+00 | 3.8062E+00 |
| 31 | 3.7545E+00 | 3.7623E+00 | 3.7705E+00 | 3.7778E+00 | 3.7836E+00 | 3.7877E+00 |
| 30 | 3.7500E+00 | 3.7561E+00 | 3.7608E+00 | 3.7648E+00 | 3.7679E+00 | 3.7702E+00 |
| 29 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 |
| 28 | 4.6129E+00 | 4.5046E+00 | 4.4516E+00 | 4.4224E+00 | 4.4052E+00 | 4.3950E+00 |
| 27 | 5.2920E+00 | 5.1775E+00 | 5.1058E+00 | 5.0607E+00 | 5.0322E+00 | 5.0146E+00 |
| 26 | 5.8891E+00 | 5.7866E+00 | 5.7135E+00 | 5.6632E+00 | 5.6294E+00 | 5.6080E+00 |
| 25 | 6.5148E+00 | 6.4282E+00 | 6.3615E+00 | 6.3126E+00 | 6.2783E+00 | 6.2556E+00 |
| 24 | 7.1859E+00 | 7.1153E+00 | 7.0581E+00 | 7.0141E+00 | 6.9819E+00 | 6.9601E+00 |
| 23 | 7.8203E+00 | 7.7628E+00 | 7.7148E+00 | 7.6765E+00 | 7.6476E+00 | 7.6277E+00 |
| 22 | 8.4253E+00 | 8.3785E+00 | 8.3385E+00 | 8.3058E+00 | 8.2807E+00 | 8.2630E+00 |
| 21 | 9.0060E+00 | 8.9679E+00 | 8.9346E+00 | 8.9071E+00 | 8.8856E+00 | 8.8702E+00 |
| 20 | 9.5660E+00 | 9.5347E+00 | 9.5072E+00 | 9.4841E+00 | 9.4658E+00 | 9.4527E+00 |
| 19 | 1.0108E+01 | 1.0082E+01 | 1.0059E+01 | 1.0040E+01 | 1.0025E+01 | 1.0013E+01 |
| 18 | 1.0634E+01 | 1.0612E+01 | 1.0593E+01 | 1.0577E+01 | 1.0564E+01 | 1.0555E+01 |
| 17 | 1.1145E+01 | 1.1127E+01 | 1.1111E+01 | 1.1098E+01 | 1.1087E+01 | 1.1079E+01 |
| 16 | 1.1644E+01 | 1.1628E+01 | 1.1615E+01 | 1.1603E+01 | 1.1594E+01 | 1.1587E+01 |
| 15 | 1.2130E+01 | 1.2117E+01 | 1.2105E+01 | 1.2095E+01 | 1.2087E+01 | 1.2081E+01 |
| 14 | 1.2605E+01 | 1.2594E+01 | 1.2583E+01 | 1.2575E+01 | 1.2568E+01 | 1.2563E+01 |
| 13 | 1.3069E+01 | 1.3059E+01 | 1.3051E+01 | 1.3043E+01 | 1.3037E+01 | 1.3033E+01 |
| 12 | 1.3524E+01 | 1.3515E+01 | 1.3507E+01 | 1.3501E+01 | 1.3495E+01 | 1.3492E+01 |
| 11 | 1.3969E+01 | 1.3961E+01 | 1.3954E+01 | 1.3948E+01 | 1.3944E+01 | 1.3941E+01 |
| 10 | 1.4406E+01 | 1.4398E+01 | 1.4392E+01 | 1.4387E+01 | 1.4383E+01 | 1.4380E+01 |
| 9 | 1.4833E+01 | 1.4827E+01 | 1.4821E+01 | 1.4817E+01 | 1.4813E+01 | 1.4811E+01 |
| 8 | 1.5253E+01 | 1.5248E+01 | 1.5243E+01 | 1.5239E+01 | 1.5236E+01 | 1.5233E+01 |
| 7 | 1.5665E+01 | 1.5660E+01 | 1.5656E+01 | 1.5653E+01 | 1.5650E+01 | 1.5648E+01 |
| 6 | 1.6070E+01 | 1.6066E+01 | 1.6063E+01 | 1.6060E+01 | 1.6058E+01 | 1.6056E+01 |
| 5 | 1.6468E+01 | 1.6465E+01 | 1.6462E+01 | 1.6460E+01 | 1.6458E+01 | 1.6457E+01 |
| 4 | 1.6860E+01 | 1.6857E+01 | 1.6855E+01 | 1.6854E+01 | 1.6852E+01 | 1.6851E+01 |
| 3 | 1.7246E+01 | 1.7244E+01 | 1.7242E+01 | 1.7241E+01 | 1.7240E+01 | 1.7240E+01 |
| 2 | 1.7625E+01 | 1.7625E+01 | 1.7624E+01 | 1.7623E+01 | 1.7623E+01 | 1.7623E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 49 | 50 | 51 | 52 | 53 | 54 |

| | 55 | 56 |
|---|---|---|
| 50 | 4.2069E+00 | 4.2101E+00 |
| 49 | 4.1982E+00 | 4.2015E+00 |
| 48 | 4.1915E+00 | 4.1944E+00 |
| 47 | 4.1811E+00 | 4.1838E+00 |
| 46 | 4.1671E+00 | 4.1698E+00 |
| 45 | 4.1498E+00 | 4.1525E+00 |
| 44 | 4.1295E+00 | 4.1321E+00 |
| 43 | 4.1065E+00 | 4.1090E+00 |
| 42 | 4.0810E+00 | 4.0835E+00 |
| 41 | 4.0536E+00 | 4.0560E+00 |
| 40 | 4.0247E+00 | 4.0271E+00 |
| 39 | 3.9949E+00 | 3.9973E+00 |
| 38 | 3.9648E+00 | 3.9672E+00 |

| | | |
|---|---|---|
| 37 | 3.9350E+00 | 3.9375E+00 |
| 36 | 3.9063E+00 | 3.9087E+00 |
| 35 | 3.8791E+00 | 3.8815E+00 |
| 34 | 3.8540E+00 | 3.8561E+00 |
| 33 | 3.8309E+00 | 3.8327E+00 |
| 32 | 3.8098E+00 | 3.8112E+00 |
| 31 | 3.7903E+00 | 3.7913E+00 |
| 30 | 3.7716E+00 | 3.7721E+00 |
| 29 | 3.7500E+00 | 3.7500E+00 |
| 28 | 4.3895E+00 | 4.3878E+00 |
| 27 | 5.0051E+00 | 5.0021E+00 |
| 26 | 5.5960E+00 | 5.5922E+00 |
| 25 | 6.2428E+00 | 6.2386E+00 |
| 24 | 6.9475E+00 | 6.9433E+00 |
| 23 | 7.6159E+00 | 7.6120E+00 |
| 22 | 8.2525E+00 | 8.2490E+00 |
| 21 | 8.8610E+00 | 8.8579E+00 |
| 20 | 9.4447E+00 | 9.4420E+00 |
| 19 | 1.0007E+01 | 1.0004E+01 |
| 18 | 1.0549E+01 | 1.0547E+01 |
| 17 | 1.1074E+01 | 1.1072E+01 |
| 16 | 1.1583E+01 | 1.1581E+01 |
| 15 | 1.2078E+01 | 1.2077E+01 |
| 14 | 1.2560E+01 | 1.2559E+01 |
| 13 | 1.3030E+01 | 1.3029E+01 |
| 12 | 1.3489E+01 | 1.3488E+01 |
| 11 | 1.3938E+01 | 1.3938E+01 |
| 10 | 1.4378E+01 | 1.4378E+01 |
| 9 | 1.4809E+01 | 1.4809E+01 |
| 8 | 1.5232E+01 | 1.5232E+01 |
| 7 | 1.5647E+01 | 1.5647E+01 |
| 6 | 1.6055E+01 | 1.6055E+01 |
| 5 | 1.6456E+01 | 1.6456E+01 |
| 4 | 1.6851E+01 | 1.6851E+01 |
| 3 | 1.7239E+01 | 1.7239E+01 |
| 2 | 1.7622E+01 | 1.7622E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 |
| | 55 | 56 |

************ End of logbook ************

Units of all fluxes in [ft^3/d]

| i | j | flux | CodeID | Node# | |
|---|---|---|---|---|---|
| 2 | 1 | 1122.1190 | 1 | 1 | constant head |
| 3 | 1 | 442.1129 | 1 | 2 | constant head |
| 4 | 1 | 325.2269 | 1 | 3 | constant head |
| 5 | 1 | 248.9222 | 1 | 4 | constant head |
| 6 | 1 | 193.8247 | 1 | 5 | constant head |
| 7 | 1 | 151.4928 | 1 | 6 | constant head |
| 8 | 1 | 117.7357 | 1 | 7 | constant head |
| 9 | 1 | 90.2490 | 1 | 8 | constant head |
| 10 | 1 | 67.6821 | 1 | 9 | constant head |
| 11 | 1 | 49.2271 | 1 | 10 | constant head |
| 12 | 1 | 34.4339 | 1 | 11 | constant head |
| 13 | 1 | 23.1172 | 1 | 12 | constant head |
| 14 | 1 | 15.3421 | 1 | 13 | constant head |
| 15 | 1 | 11.4488 | 1 | 14 | constant head |
| 16 | 1 | 12.1525 | 1 | 15 | constant head |
| 17 | 1 | 17.9093 | 1 | 16 | constant head |
| 19 | 1 | 26.3836 | 1 | 17 | constant head |
| 20 | 1 | 53.8486 | 1 | 18 | constant head |
| 22 | 1 | 84.2980 | 1 | 19 | constant head |
| 23 | 1 | 125.2780 | 1 | 20 | constant head |
| 26 | 1 | 127.8611 | 1 | 21 | constant head |
| 28 | 1 | 142.3969 | 1 | 22 | constant head |
| 30 | 1 | 160.1867 | 1 | 23 | constant head |
| 31 | 1 | 183.2875 | 1 | 24 | constant head |
| 32 | 1 | 200.0755 | 1 | 25 | constant head |
| 33 | 1 | 225.3988 | 1 | 26 | constant head |
| 34 | 1 | 243.5457 | 1 | 27 | constant head |
| 35 | 1 | 257.4986 | 1 | 28 | constant head |
| 36 | 1 | 268.5481 | 1 | 29 | constant head |
| 37 | 1 | 277.3967 | 1 | 30 | constant head |
| 38 | 1 | 284.5114 | 1 | 31 | constant head |
| 39 | 1 | 290.2453 | 1 | 32 | constant head |
| 40 | 1 | 294.8759 | 1 | 33 | constant head |
| 41 | 1 | 298.6307 | 1 | 34 | constant head |
| 42 | 1 | 301.6892 | 1 | 35 | constant head |
| 43 | 1 | 304.1965 | 1 | 36 | constant head |
| 44 | 1 | 306.2659 | 1 | 37 | constant head |
| 45 | 1 | 307.9851 | 1 | 38 | constant head |
| 46 | 1 | 309.4229 | 1 | 39 | constant head |
| 47 | 1 | 310.6324 | 1 | 40 | constant head |
| 48 | 1 | 311.6495 | 1 | 41 | constant head |
| 49 | 1 | 312.5053 | 1 | 42 | constant head |
| 50 | 1 | 313.2199 | 1 | 43 | constant head |
| 51 | 1 | 313.8068 | 1 | 44 | constant head |
| 52 | 1 | 314.2773 | 1 | 45 | constant head |
| 53 | 1 | 314.6387 | 1 | 46 | constant head |
| 54 | 1 | 314.8944 | 1 | 47 | constant head |
| 55 | 1 | 315.0480 | 1 | 48 | constant head |
| 56 | 1 | 157.5519 | 1 | 49 | constant head |
| 56 | 29 | -190.1300 | 2 | 50 | constant head |
| 55 | 29 | -380.8866 | 2 | 51 | constant head |
| 54 | 29 | -383.0841 | 2 | 52 | constant head |
| 53 | 29 | -387.4239 | 2 | 53 | constant head |
| 52 | 29 | -395.2574 | 2 | 54 | constant head |
| 51 | 29 | -409.5289 | 2 | 55 | constant head |
| 50 | 29 | -437.1528 | 2 | 56 | constant head |

| | | | | | |
|---|---|---|---|---|---|
| 49 | 29 | -772.4538 | 2 | 57 | constant head |
| 49 | 30 | -9.0856 | 2 | 58 | constant head |
| 48 | 30 | -687.7288 | 2 | 59 | constant head |
| 48 | 31 | -216.8455 | 2 | 60 | constant head |
| 48 | 32 | -168.5954 | 2 | 61 | constant head |
| 49 | 33 | -52.5125 | 2 | 62 | constant head |
| 49 | 34 | -48.0338 | 2 | 63 | constant head |
| 49 | 35 | -94.7269 | 2 | 64 | constant head |
| 48 | 35 | -61.4317 | 2 | 65 | constant head |
| 47 | 35 | -86.7455 | 2 | 66 | constant head |
| 46 | 35 | -120.9075 | 2 | 67 | constant head |
| 45 | 35 | -154.7158 | 2 | 68 | constant head |
| 44 | 35 | -288.4169 | 2 | 69 | constant head |
| 44 | 36 | -58.6304 | 2 | 70 | constant head |
| 43 | 36 | -135.8223 | 2 | 71 | constant head |
| 42 | 36 | -180.0203 | 2 | 72 | constant head |
| 41 | 36 | -256.8163 | 2 | 73 | constant head |
| 40 | 37 | -138.1300 | 2 | 74 | constant head |
| 39 | 37 | -151.5624 | 2 | 75 | constant head |
| 38 | 37 | -166.4763 | 2 | 76 | constant head |
| 37 | 37 | -174.4068 | 2 | 77 | constant head |
| 36 | 37 | -179.4621 | 2 | 78 | constant head |
| 35 | 37 | -184.4096 | 2 | 79 | constant head |
| 34 | 37 | -231.4555 | 2 | 80 | constant head |
| 32 | 38 | -113.4780 | 2 | 81 | constant head |
| 31 | 38 | -168.4890 | 2 | 82 | constant head |
| 30 | 39 | -74.1177 | 2 | 83 | constant head |
| 28 | 39 | -69.4351 | 2 | 84 | constant head |
| 26 | 39 | -78.3875 | 2 | 85 | constant head |
| 23 | 40 | -19.3502 | 2 | 86 | constant head |
| 22 | 41 | -17.8553 | 2 | 87 | constant head |
| 20 | 42 | -19.0211 | 2 | 88 | constant head |
| 19 | 43 | -18.0385 | 2 | 89 | constant head |
| 17 | 44 | -15.8400 | 2 | 90 | constant head |
| 16 | 45 | -14.3729 | 2 | 91 | constant head |
| 15 | 46 | -11.8595 | 2 | 92 | constant head |
| 14 | 47 | -9.1055 | 2 | 93 | constant head |
| 13 | 48 | -6.1595 | 2 | 94 | constant head |
| 12 | 49 | -3.1132 | 2 | 95 | constant head |
| 11 | 50 | -0.3954 | 2 | 96 | constant head |
| 33 | 38 | -103.2755 | 2 | 97 | constant head |
| 56 | 28 | 0.0000 | 3 | 1 | flux node |
| 56 | 27 | 0.0000 | 3 | 2 | flux node |
| 56 | 26 | 0.0000 | 3 | 3 | flux node |
| 56 | 25 | 0.0000 | 3 | 4 | flux node |
| 56 | 24 | 0.0000 | 3 | 5 | flux node |
| 56 | 23 | 0.0000 | 3 | 6 | flux node |
| 56 | 22 | 0.0000 | 3 | 7 | flux node |
| 56 | 21 | 0.0000 | 3 | 8 | flux node |
| 56 | 20 | 0.0000 | 3 | 9 | flux node |
| 56 | 19 | 0.0000 | 3 | 10 | flux node |
| 56 | 18 | 0.0000 | 3 | 11 | flux node |
| 56 | 17 | 0.0000 | 3 | 12 | flux node |
| 56 | 16 | 0.0000 | 3 | 13 | flux node |
| 56 | 15 | 0.0000 | 3 | 14 | flux node |
| 56 | 14 | 0.0000 | 3 | 15 | flux node |
| 56 | 13 | 0.0000 | 3 | 16 | flux node |
| 56 | 12 | 0.0000 | 3 | 17 | flux node |

| | | | | | |
|---|---|---|---|---|---|
| 56 | 11 | 0.0000 | 3 | 18 | flux node |
| 56 | 10 | 0.0000 | 3 | 19 | flux node |
| 56 | 9 | 0.0000 | 3 | 20 | flux node |
| 56 | 8 | 0.0000 | 3 | 21 | flux node |
| 56 | 7 | 0.0000 | 3 | 22 | flux node |
| 56 | 6 | 0.0000 | 3 | 23 | flux node |
| 56 | 5 | 0.0000 | 3 | 24 | flux node |
| 56 | 4 | 0.0000 | 3 | 25 | flux node |
| 56 | 3 | 0.0000 | 3 | 26 | flux node |
| 56 | 2 | 0.0000 | 3 | 27 | flux node |
| 1 | 25 | -388.6525 | 4 | 28 | flux node |
| 1 | 24 | -266.2481 | 4 | 29 | flux node |
| 1 | 23 | -275.5384 | 4 | 30 | flux node |
| 1 | 22 | -284.4212 | 4 | 31 | flux node |
| 1 | 21 | -293.0828 | 4 | 32 | flux node |
| 1 | 20 | -300.6810 | 4 | 33 | flux node |
| 1 | 19 | -307.2807 | 4 | 34 | flux node |
| 1 | 18 | -313.1443 | 4 | 35 | flux node |
| 1 | 17 | -318.4813 | 4 | 36 | flux node |
| 1 | 16 | -323.4344 | 4 | 37 | flux node |
| 1 | 15 | -328.1013 | 4 | 38 | flux node |
| 1 | 14 | -332.5540 | 4 | 39 | flux node |
| 1 | 13 | -336.8506 | 4 | 40 | flux node |
| 1 | 12 | -341.0422 | 4 | 41 | flux node |
| 1 | 11 | -345.1771 | 4 | 42 | flux node |
| 1 | 10 | -349.3039 | 4 | 43 | flux node |
| 1 | 9 | -353.4749 | 4 | 44 | flux node |
| 1 | 8 | -357.7490 | 4 | 45 | flux node |
| 1 | 7 | -362.1957 | 4 | 46 | flux node |
| 1 | 6 | -366.8998 | 4 | 47 | flux node |
| 1 | 5 | -371.9643 | 4 | 48 | flux node |
| 1 | 4 | -377.5020 | 4 | 49 | flux node |
| 1 | 3 | -383.5578 | 4 | 50 | flux node |
| 1 | 2 | -389.6848 | 4 | 51 | flux node |
| 1 | 1 | -392.7563 | 4 | 52 | flux node |
| 23 | 4 | -638.5701 | 5 | 1 | river node |
| 28 | 6 | -684.0515 | 5 | 2 | river node |
| 32 | 10 | -25.0895 | 5 | 3 | river node |
| 31 | 12 | -124.1163 | 5 | 4 | river node |
| 31 | 15 | -651.2838 | 5 | 5 | river node |
| 30 | 17 | -1136.9909 | 5 | 6 | river node |
| 29 | 19 | -1360.1969 | 5 | 7 | river node |
| 27 | 22 | -1160.9935 | 5 | 8 | river node |
| 26 | 25 | -455.4837 | 5 | 9 | river node |
| 23 | 27 | -460.8940 | 5 | 10 | river node |
| 18 | 30 | -109.7769 | 5 | 11 | river node |
| 19 | 35 | -65.3861 | 5 | 12 | river node |
| 23 | 37 | -129.9179 | 5 | 13 | river node |
| 21 | 33 | -116.1985 | 5 | 14 | river node |
| 21 | 29 | -196.4635 | 5 | 15 | river node |
| 21 | 36 | -75.4429 | 5 | 16 | river node |

Sum of all fluxes organized in Codes :

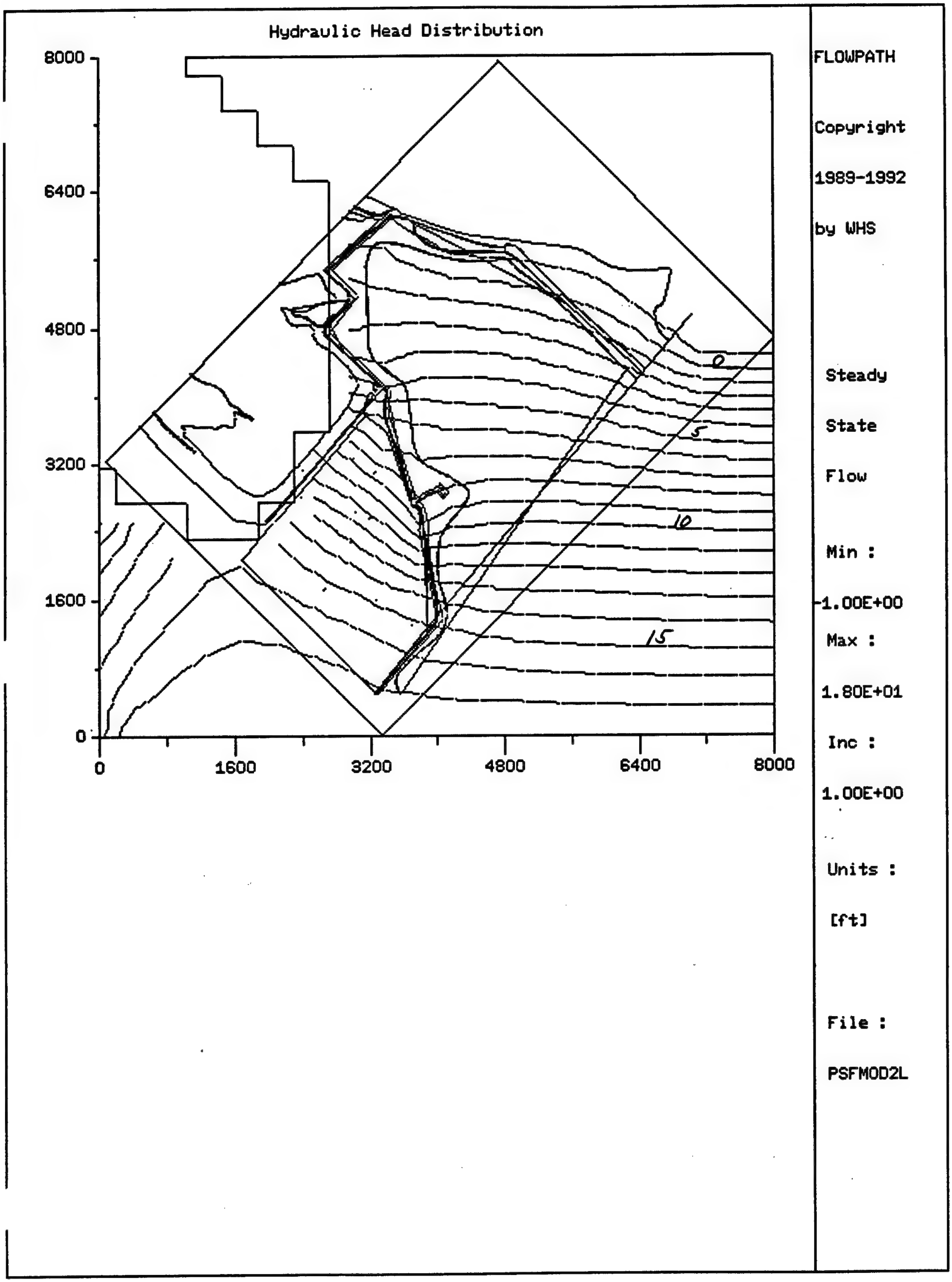
5

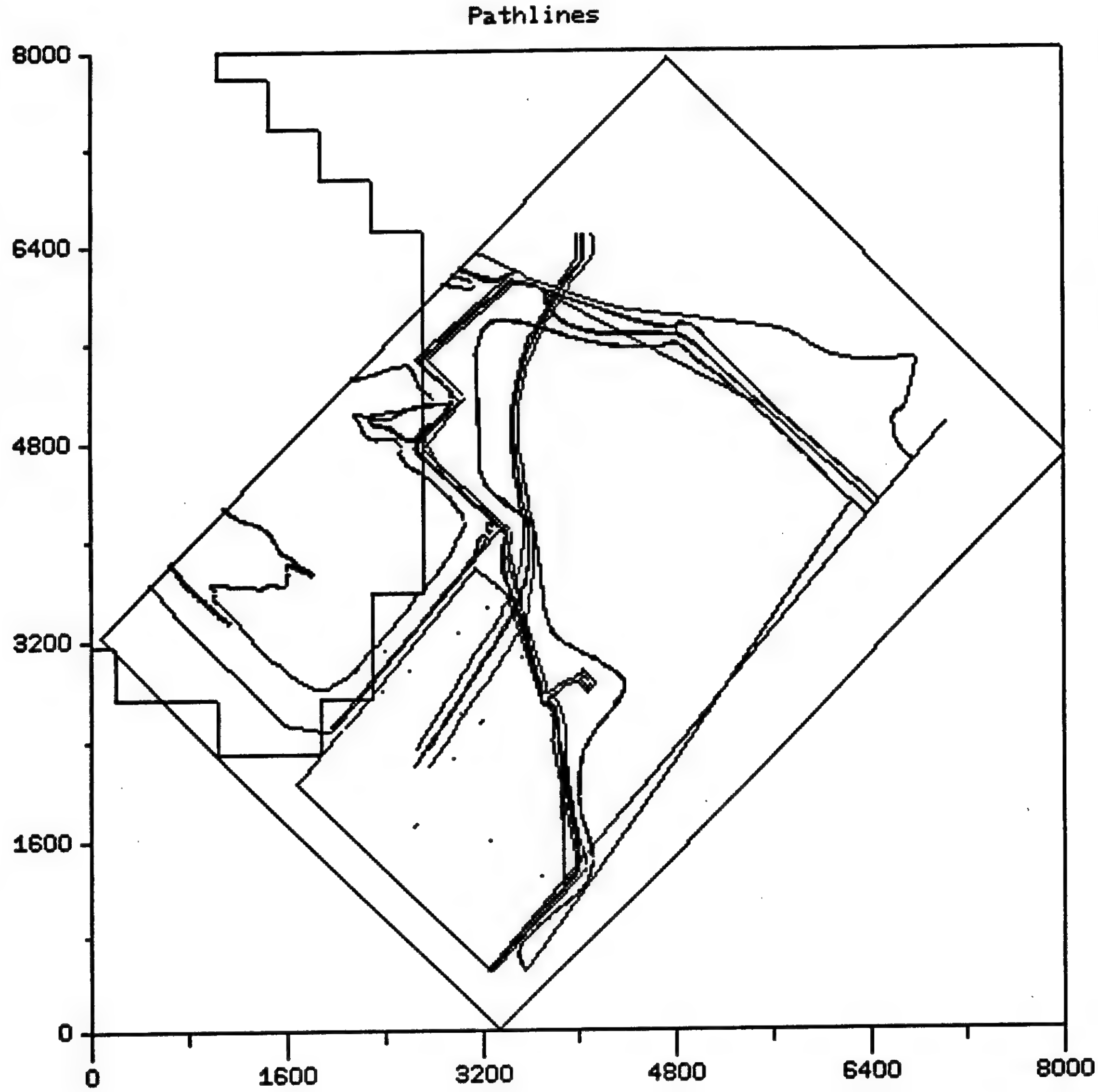
| | | | |
|---|---|---|---|
| 1 | 10975.0449 | CodeID | Total flux |
| 2 | -7945.1494 | CodeID | Total flux |
| 3 | 0.0000 | CodeID | Total flux |
| 4 | -8459.7783 | CodeID | Total flux |

```
5      -7390.8564   CodeID    Total flux

Global water balance [ft^3/d] :
  10975.0464      total  IN-flux through const. head nodes
  -7945.1494      total OUT-flux through const. head nodes
      0.0000      total  IN-flux through flux nodes
  -8459.7786      total OUT-flux through flux nodes
      0.0000      total  IN-flux through river nodes
  -7390.8562      total OUT-flux through river nodes
      0.0000      total  IN-flux through injection wells
      0.0000      total OUT-flux through pumping wells
  11778.7601       total net aquifer recharge
  -1041.9776      sum of all fluxes should be zero
     -2.2384%     total mass balance error
```

**PSFMOD2L**


Hydraulic Head Distribution
8000
6400
4800
3200
1600
0
0
1600
3200
4800
6400
8000
0
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
-1.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD2L




FLOWPATH

Copyright

1989-1992

by WHS

Steady

State

Flow

Time :

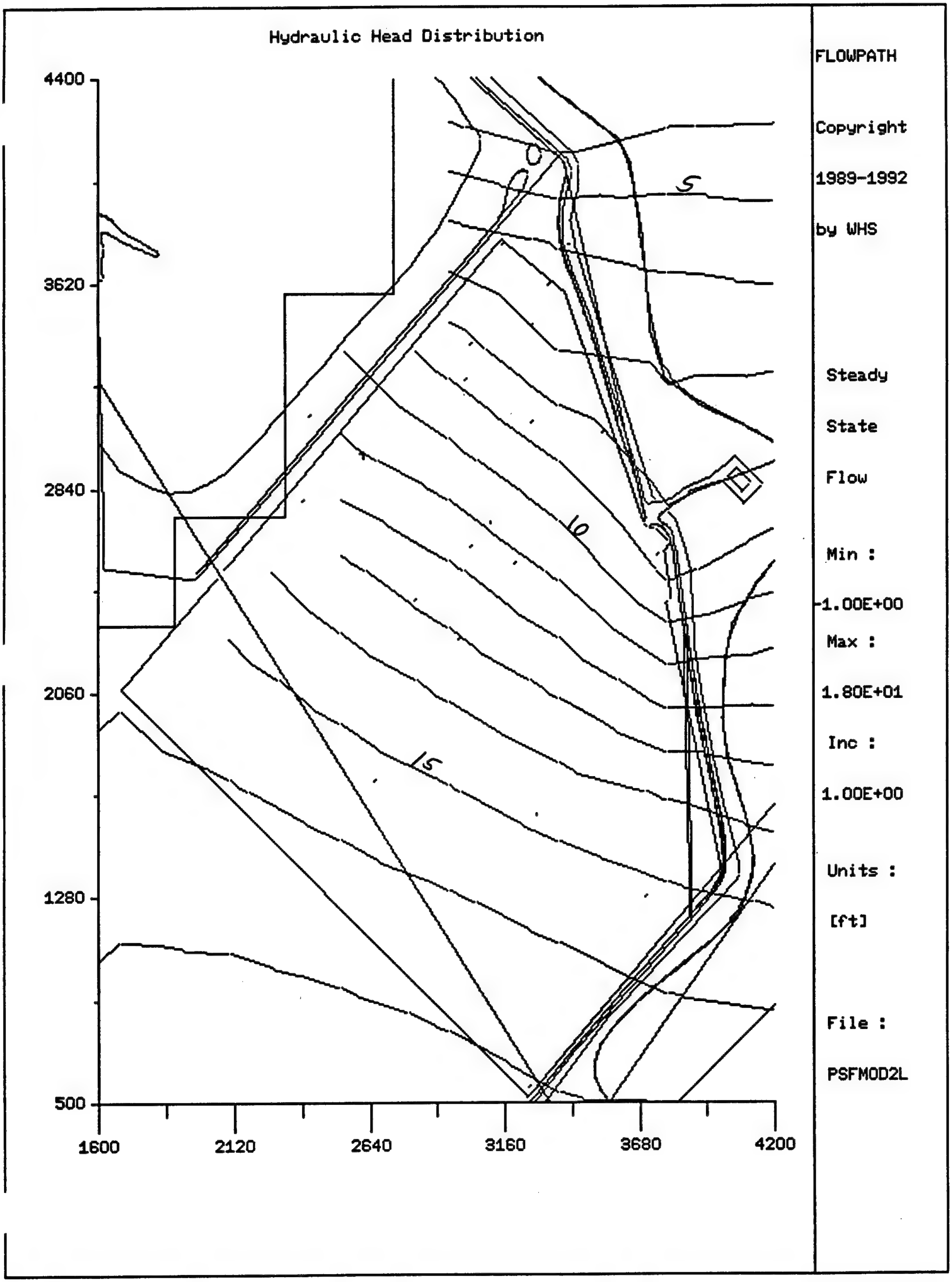
steady

Units :

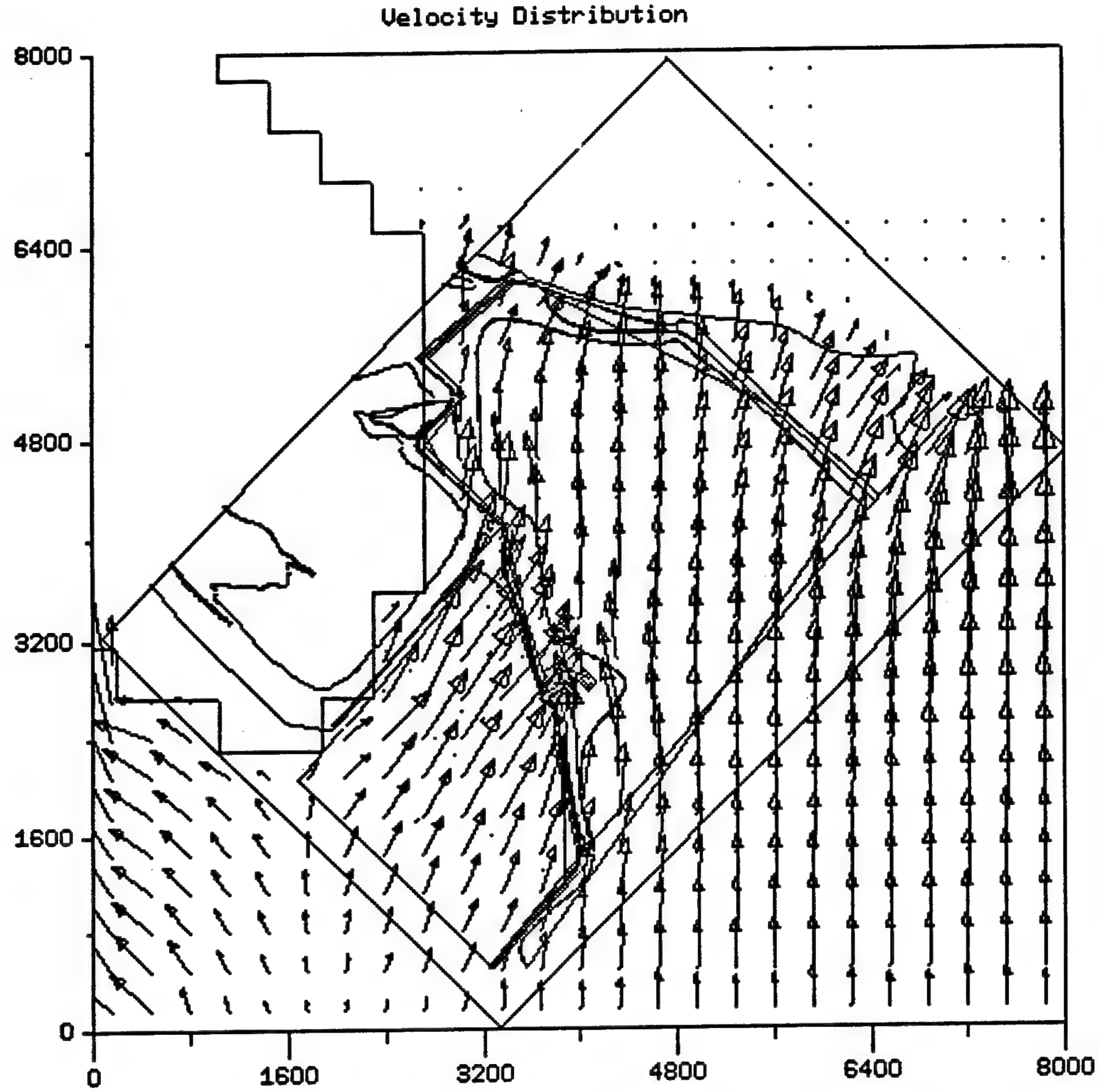
[ft]

File :

PSFMOD2L



Hydraulic Head Distribution
4400
3620
2840
2060
1280
500
1600
2120
2640
3160
3680
4200
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
-1.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD2L




FLOWPATH



# Wells:

0

Vmin :

0.00E+00

Vmax :

3.21E+00

Vavg :

9.52E-01

Angle:

8.40E+01

Units :

[ft]

File :

PSFMOD2L

^[S^A
^[C(

```
*************************************************************
*                     E C H O P R I N T                     *
*                                                           *
*                      F L O W P A T H                      *
*                        version 3.0                        *
*                                                           *
*  FLOWPATH was written by Thomas Franz and Nilson Guiguer  *
*                                                           *
*************************************************************
*                                                           *
*                   Copyright 1989, 1992                    *
*                            by                             *
*              Waterloo Hydrogeologic Software              *
*                  200 Candlewood Crescent                  *
*                     Waterloo, Ontario                     *
*                     N2L 5Y9, Canada                       *
*                                                           *
*                     ph (519) 746-1798                     *
*                                                           *
*************************************************************
```

FLOWPATH logbook for data set : PSFMOD2L

Unit System : English units [ft/gal/d]

***** GRID PARAMETERS *****

Number of x-grid lines : 20

Number of y-grid lines : 20

Grid coordinates (x-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 4.21053E+02 |
| 3 | 8.42105E+02 |
| 4 | 1.26316E+03 |
| 5 | 1.68421E+03 |
| 6 | 2.10526E+03 |
| 7 | 2.52632E+03 |
| 8 | 2.94737E+03 |
| 9 | 3.36842E+03 |
| 10 | 3.78947E+03 |
| 11 | 4.21053E+03 |
| 12 | 4.63158E+03 |
| 13 | 5.05263E+03 |
| 14 | 5.47368E+03 |
| 15 | 5.89474E+03 |

| | |
|---|---|
| 16 | 6.31579E+03 |
| 17 | 6.73684E+03 |
| 18 | 7.15789E+03 |
| 19 | 7.57895E+03 |
| 20 | 8.00000E+03 |

Grid coordinates (y-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 4.21053E+02 |
| 3 | 8.42105E+02 |
| 4 | 1.26316E+03 |
| 5 | 1.68421E+03 |
| 6 | 2.10526E+03 |
| 7 | 2.52632E+03 |
| 8 | 2.94737E+03 |
| 9 | 3.36842E+03 |
| 10 | 3.78947E+03 |
| 11 | 4.21053E+03 |
| 12 | 4.63158E+03 |
| 13 | 5.05263E+03 |
| 14 | 5.47368E+03 |
| 15 | 5.89474E+03 |
| 16 | 6.31579E+03 |
| 17 | 6.73684E+03 |
| 18 | 7.15789E+03 |
| 19 | 7.57895E+03 |
| 20 | 8.00000E+03 |

***** WELL PARAMETERS *****

Number of wells : 0

***** CONSTRAINED HEAD NODES *****

Number of constant head nodes : 38

| No. | i | j | X [ft] | Y [ft] | const. head [ft] |
|---|---|---|---|---|---|
| 1 | 14 | 15 | 5.46903E+03 | 5.89381E+03 | -1.88000E+00 |
| 2 | 15 | 15 | 5.89381E+03 | 5.89381E+03 | -1.88000E+00 |
| 3 | 9 | 16 | 3.36283E+03 | 6.31858E+03 | -1.88000E+00 |
| 4 | 4 | 20 | 1.25664E+03 | 8.00000E+03 | -1.88000E+00 |
| 5 | 5 | 19 | 1.68142E+03 | 7.57522E+03 | -1.88000E+00 |
| 6 | 11 | 15 | 4.21239E+03 | 5.89381E+03 | -1.88000E+00 |
| 7 | 16 | 14 | 6.31858E+03 | 5.46903E+03 | -1.88000E+00 |
| 8 | 13 | 15 | 5.04425E+03 | 5.89381E+03 | -1.88000E+00 |
| 9 | 10 | 16 | 3.78761E+03 | 6.31858E+03 | -1.88000E+00 |
| 10 | 12 | 15 | 4.63717E+03 | 5.89381E+03 | -1.88000E+00 |
| 11 | 6 | 18 | 2.10619E+03 | 7.15044E+03 | -1.88000E+00 |

| | | | | | |
|---|---|---|---|---|---|
| 12 | 11 | 16 | 4.21239E+03 | 6.31858E+03 | -1.88000E+00 |
| 13 | 9 | 17 | 3.36283E+03 | 6.74336E+03 | -1.88000E+00 |
| 14 | 20 | 12 | 8.00000E+03 | 4.63717E+03 | -1.88000E+00 |
| 15 | 19 | 12 | 7.57522E+03 | 4.63717E+03 | -1.88000E+00 |
| 16 | 18 | 12 | 7.15044E+03 | 4.63717E+03 | -1.88000E+00 |
| 17 | 7 | 17 | 2.53097E+03 | 6.74336E+03 | -1.88000E+00 |
| 18 | 8 | 17 | 2.95575E+03 | 6.74336E+03 | -1.88000E+00 |
| 19 | 17 | 13 | 6.74336E+03 | 5.04425E+03 | -1.88000E+00 |
| 20 | 2 | 1 | 4.24779E+02 | 0.00000E+00 | 1.80000E+01 |
| 21 | 3 | 1 | 8.49558E+02 | 0.00000E+00 | 1.80000E+01 |
| 22 | 4 | 1 | 1.25664E+03 | 0.00000E+00 | 1.80000E+01 |
| 23 | 5 | 1 | 1.68142E+03 | 0.00000E+00 | 1.80000E+01 |
| 24 | 6 | 1 | 2.10619E+03 | 0.00000E+00 | 1.80000E+01 |
| 25 | 7 | 1 | 2.53097E+03 | 0.00000E+00 | 1.80000E+01 |
| 26 | 8 | 1 | 2.95575E+03 | 0.00000E+00 | 1.80000E+01 |
| 27 | 9 | 1 | 3.36283E+03 | 0.00000E+00 | 1.80000E+01 |
| 28 | 10 | 1 | 3.78761E+03 | 0.00000E+00 | 1.80000E+01 |
| 29 | 11 | 1 | 4.21239E+03 | 0.00000E+00 | 1.80000E+01 |
| 30 | 12 | 1 | 4.63717E+03 | 0.00000E+00 | 1.80000E+01 |
| 31 | 13 | 1 | 5.04425E+03 | 0.00000E+00 | 1.80000E+01 |
| 32 | 14 | 1 | 5.46903E+03 | 0.00000E+00 | 1.80000E+01 |
| 33 | 15 | 1 | 5.89381E+03 | 0.00000E+00 | 1.80000E+01 |
| 34 | 16 | 1 | 6.31858E+03 | 0.00000E+00 | 1.80000E+01 |
| 35 | 17 | 1 | 6.74336E+03 | 0.00000E+00 | 1.80000E+01 |
| 36 | 18 | 1 | 7.15044E+03 | 0.00000E+00 | 1.80000E+01 |
| 37 | 19 | 1 | 7.57522E+03 | 0.00000E+00 | 1.80000E+01 |
| 38 | 20 | 1 | 8.00000E+03 | 0.00000E+00 | 1.80000E+01 |

***** SPECIFIED FLUX NODES *****

Number of flux nodes : 18

| No. | i | j | X [ft] | Y [ft] | nodal flow [ft^3/ft^2/d] |
|---|---|---|---|---|---|
| 1 | 20 | 11 | 8.00000E+03 | 4.21239E+03 | 0.00000E+00 |
| 2 | 20 | 10 | 8.00000E+03 | 3.78761E+03 | 0.00000E+00 |
| 3 | 20 | 9 | 8.00000E+03 | 3.36283E+03 | 0.00000E+00 |
| 4 | 20 | 8 | 8.00000E+03 | 2.95575E+03 | 0.00000E+00 |
| 5 | 20 | 7 | 8.00000E+03 | 2.53097E+03 | 0.00000E+00 |
| 6 | 20 | 6 | 8.00000E+03 | 2.10619E+03 | 0.00000E+00 |
| 7 | 20 | 5 | 8.00000E+03 | 1.68142E+03 | 0.00000E+00 |
| 8 | 20 | 4 | 8.00000E+03 | 1.25664E+03 | 0.00000E+00 |
| 9 | 20 | 3 | 8.00000E+03 | 8.49558E+02 | 0.00000E+00 |
| 10 | 20 | 2 | 8.00000E+03 | 4.24779E+02 | 0.00000E+00 |
| 11 | 1 | 1 | 0.00000E+00 | 0.00000E+00 | -3.36000E+00 |
| 12 | 1 | 2 | 0.00000E+00 | 4.24779E+02 | -3.36000E+00 |
| 13 | 1 | 3 | 0.00000E+00 | 8.49558E+02 | -3.36000E+00 |
| 14 | 1 | 4 | 0.00000E+00 | 1.25664E+03 | -3.36000E+00 |
| 15 | 1 | 5 | 0.00000E+00 | 1.68142E+03 | -3.36000E+00 |
| 16 | 1 | 6 | 0.00000E+00 | 2.10619E+03 | -3.36000E+00 |
| 17 | 1 | 7 | 0.00000E+00 | 2.53097E+03 | -3.36000E+00 |
| 18 | 1 | 8 | 0.00000E+00 | 2.95575E+03 | -3.36000E+00 |

***** SURFACE WATER BODIES *****

Number of surface water body nodes : 13

| No. | i | j | X [ft] | Y [ft] | water table [ft] | bottom elevation [ft] | leakage factor [ft/d] |
|---|---|---|---|---|---|---|---|
| 1 | 9 | 11 | 3.363E+03 | 4.212E+03 | 3.000E+00 | 2.000E+00 | 1.0000E-01 |
| 2 | 9 | 2 | 3.363E+03 | 4.248E+02 | 1.700E+01 | 1.600E+01 | 1.0000E-01 |
| 3 | 10 | 3 | 3.788E+03 | 8.496E+02 | 1.600E+01 | 1.500E+01 | 1.0000E-01 |
| 4 | 11 | 4 | 4.212E+03 | 1.257E+03 | 1.500E+01 | 1.400E+01 | 1.0000E-01 |
| 5 | 10 | 5 | 3.788E+03 | 1.681E+03 | 1.400E+01 | 1.300E+01 | 1.0000E-01 |
| 6 | 10 | 6 | 3.788E+03 | 2.106E+03 | 1.100E+01 | 1.000E+01 | 1.0000E-01 |
| 7 | 10 | 7 | 3.788E+03 | 2.531E+03 | 8.000E+00 | 7.000E+00 | 1.0000E-01 |
| 8 | 10 | 8 | 3.788E+03 | 2.956E+03 | 7.000E+00 | 6.000E+00 | 1.0000E-01 |
| 9 | 9 | 10 | 3.363E+03 | 3.788E+03 | 6.000E+00 | 5.000E+00 | 1.0000E-01 |
| 10 | 8 | 12 | 2.956E+03 | 4.637E+03 | 2.000E+00 | 1.000E+00 | 1.0000E-01 |
| 11 | 8 | 14 | 2.956E+03 | 5.469E+03 | 1.000E+00 | 0.000E+00 | 1.0000E-01 |
| 12 | 9 | 15 | 3.363E+03 | 5.894E+03 | 0.000E+00 | -1.000E+00 | 1.0000E-01 |
| 13 | 9 | 9 | 3.363E+03 | 3.363E+03 | 6.500E+00 | 5.500E+00 | 1.0000E-01 |

***** AQUIFER PROPERTIES *****

Number of different material properties : 7

| No. | Kxx [ft/d] | Kyy [ft/d] | Porosity [-] | |
|---|---|---|---|---|
| 1 | 3.00000E+01 | 3.00000E+01 | 3.00000E-01 | (default) |
| 2 | 2.00000E+01 | 2.00000E+01 | 3.00000E-01 | |
| 3 | 1.00000E+01 | 1.00000E+01 | 3.00000E-01 | |
| 4 | 1.00000E+01 | 1.00000E+01 | 3.00000E-01 | |
| 5 | 2.00000E+01 | 2.00000E+01 | 3.00000E-01 | |
| 6 | 1.50000E+01 | 1.50000E+01 | 3.00000E-01 | |
| 7 | 1.50000E+02 | 1.50000E+02 | 3.00000E-01 | |

********** DISTRIBUTION OF AQUIFER MATERIAL PROPERTIES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 19 | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 18 | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 17 | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 16 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 15 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 14 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 13 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 12 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 11 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 9 | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 7 | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 7 | 7 | 7 | 7 | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 5 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 4 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 3 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 2 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 1 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

| | 18 | 19 | 20 |
|---|---|---|---|
| 20 | 7 | 7 | 7 |
| 19 | 7 | 7 | 7 |
| 18 | 7 | 7 | 7 |
| 17 | 7 | 7 | 7 |
| 16 | 7 | 7 | 7 |
| 15 | 7 | 7 | 7 |
| 14 | 7 | 7 | 7 |
| 13 | 7 | 7 | 7 |
| 12 | 7 | 7 | 7 |
| 11 | 7 | 7 | 7 |
| 10 | 7 | 7 | 7 |
| 9 | 7 | 7 | 7 |
| 8 | 7 | 7 | 7 |
| 7 | 7 | 7 | 7 |
| 6 | 7 | 7 | 7 |
| 5 | 7 | 7 | 7 |
| 4 | 7 | 7 | 7 |
| 3 | 7 | 7 | 7 |
| 2 | 7 | 7 | 7 |
| 1 | 7 | 7 | 7 |
| | 18 | 19 | 20 |

***** AQUIFER TYPE *****

Unconfined aquifer

***** AQUIFER BOTTOM ELEVATIONS *****

Number of different aquifer bottom elevations : 3

No. aquifer bottom elevation
[ft]

1 -1.00000E+01 (default)
2 -1.50000E+01
3 -2.50000E+01

********** DISTRIBUTION OF AQUIFER BOTTOM ELEVATIONS **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 19 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 18 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 17 | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 16 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 13 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 12 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 11 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 10 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 9 | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 8 | 1 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

| | 18 | 19 | 20 |
|---|---|---|---|
| 20 | 3 | 3 | 3 |
| 19 | 3 | 3 | 3 |
| 18 | 3 | 3 | 3 |
| 17 | 3 | 3 | 3 |
| 16 | 3 | 3 | 3 |
| 15 | 3 | 3 | 3 |
| 14 | 3 | 3 | 3 |
| 13 | 3 | 3 | 3 |
| 12 | 3 | 3 | 3 |
| 11 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 |
| 8 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 |
| | 18 | 19 | 20 |

##### ***** AREAL RECHARGE *****

Number of different infiltration/evapotranspiration rates : 7

| No. | infiltration [L/T] | evapotranspiration [L/T] | effective recharge [L/T] | |
|---|---|---|---|---|
| 1 | 9.00000E-04 | 0.00000E+00 | 9.00000E-04 | (default) |
| 1 | 0.00000E+00 | 0.00000E+00 | 0.00000E+00 | |
| 1 | 2.00000E-03 | 0.00000E+00 | 2.00000E-03 | |
| 1 | 3.00000E-04 | 0.00000E+00 | 3.00000E-04 | |
| 1 | 0.00000E+00 | 0.00000E+00 | 0.00000E+00 | |
| 1 | 6.00000E-03 | 0.00000E+00 | 6.00000E-03 | |
| 1 | 3.00000E-04 | 0.00000E+00 | 3.00000E-04 | |

##### ********** DISTRIBUTION OF AREAL IN/OUT-FLUXES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 19 | * | * | * | * | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 18 | * | * | * | * | * | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 17 | * | * | * | * | * | * | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 16 | * | * | * | * | * | * | * | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 15 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 5 | 5 | 5 | 5 | 5 | 5 |
| 14 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 13 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 12 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 11 | * | * | * | * | * | * | * | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 2 |
| 10 | * | * | * | * | * | * | * | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 9 | * | * | * | * | * | * | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 6 | * | * | * | * | * | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 7 | 6 | 6 | 6 | * | * | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 3 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 2 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 1 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

| | 18 | 19 | 20 |
|---|---|---|---|
| 20 | 5 | 5 | 2 |
| 19 | 5 | 5 | 2 |
| 18 | 5 | 5 | 2 |
| 17 | 5 | 5 | 2 |
| 16 | 5 | 5 | 2 |
| 15 | 5 | 5 | 5 |
| 14 | 2 | 2 | 2 |
| 13 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 |

| | | | |
|---|---|---|---|
| 11 | 2 | 2 | 2 |
| 10 | 7 | 7 | 7 |
| 9 | 7 | 7 | 7 |
| 8 | 7 | 7 | 7 |
| 7 | 7 | 7 | 7 |
| 6 | 7 | 7 | 7 |
| 5 | 7 | 7 | 7 |
| 4 | 7 | 7 | 7 |
| 3 | 7 | 7 | 7 |
| 2 | 7 | 7 | 7 |
| 1 | 7 | 7 | 7 |
| | 18 | 19 | 20 |

***** PATHLINE & PARTICLE TRACKING DATA *****

Number of forward particles : 17

| No. | x-release | y-release |
|---|---|---|
| 1 | 2.66418E+03 | 2.35491E+03 |
| 2 | 2.77597E+03 | 2.35491E+03 |
| 3 | 2.72007E+03 | 2.29902E+03 |
| 4 | 2.65859E+03 | 2.20959E+03 |
| 5 | 2.77597E+03 | 2.20959E+03 |
| 6 | 3.62832E+03 | 2.35398E+03 |
| 7 | 3.46903E+03 | 2.35398E+03 |
| 8 | 3.30973E+03 | 1.45133E+03 |
| 9 | 3.36283E+03 | 1.45133E+03 |
| 10 | 2.72566E+03 | 1.39823E+03 |
| 11 | 2.83186E+03 | 1.39823E+03 |
| 12 | 2.24779E+03 | 1.92920E+03 |
| 13 | 2.35398E+03 | 1.92920E+03 |
| 14 | 2.03540E+03 | 2.19469E+03 |
| 15 | 1.92920E+03 | 2.19469E+03 |
| 16 | 3.15044E+03 | 3.52212E+03 |
| 17 | 3.20354E+03 | 3.52212E+03 |

Number of reverse particles : 0

No well particles specified

************ HYDRAULIC HEAD DISTRIBUTION ************

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 20 | * | * | * | -1.8800E+00 | -1.8796E+00 | -1.8784E+00 |
| 19 | * | * | * | * | -1.8800E+00 | -1.8790E+00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 18 | * | * | * | * | * | -1.8800E+00 |
| 17 | * | * | * | * | * | * |
| 16 | * | * | * | * | * | * |
| 15 | * | * | * | * | * | * |
| 14 | * | * | * | * | * | * |
| 13 | * | * | * | * | * | * |
| 12 | * | * | * | * | * | * |
| 11 | * | * | * | * | * | * |
| 10 | * | * | * | * | * | * |
| 9 | * | * | * | * | * | * |
| 8 | 5.7430E+00 | * | * | * | * | * |
| 7 | 1.0833E+01 | 1.3132E+01 | 1.4195E+01 | * | * | 1.4464E+01 |
| 6 | 1.2525E+01 | 1.3909E+01 | 1.4932E+01 | 1.5744E+01 | 1.5885E+01 | 1.5333E+01 |
| 5 | 1.3488E+01 | 1.4661E+01 | 1.5543E+01 | 1.6124E+01 | 1.6294E+01 | 1.6075E+01 |
| 4 | 1.4235E+01 | 1.5352E+01 | 1.6143E+01 | 1.6628E+01 | 1.6814E+01 | 1.6740E+01 |
| 3 | 1.4906E+01 | 1.6035E+01 | 1.6746E+01 | 1.7149E+01 | 1.7319E+01 | 1.7308E+01 |
| 2 | 1.5490E+01 | 1.6808E+01 | 1.7366E+01 | 1.7630E+01 | 1.7738E+01 | 1.7744E+01 |
| 1 | 1.5608E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 1 | 2 | 3 | 4 | 5 | 6 |

| | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| 20 | -1.8762E+00 | -1.8732E+00 | -1.8692E+00 | -1.8636E+00 | -1.8567E+00 | -1.8486E+00 |
| 19 | -1.8773E+00 | -1.8749E+00 | -1.8716E+00 | -1.8668E+00 | -1.8608E+00 | -1.8538E+00 |
| 18 | -1.8786E+00 | -1.8772E+00 | -1.8749E+00 | -1.8705E+00 | -1.8650E+00 | -1.8584E+00 |
| 17 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8758E+00 | -1.8720E+00 | -1.8660E+00 |
| 16 | * | -1.3577E+00 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8743E+00 |
| 15 | * | -3.4612E-01 | -3.2830E-01 | -1.0491E+00 | -1.8800E+00 | -1.8800E+00 |
| 14 | * | 8.4921E-01 | 4.8343E-01 | 6.8202E-02 | -3.5156E-01 | -5.3761E-01 |
| 13 | * | 1.5399E+00 | 1.4924E+00 | 1.3896E+00 | 1.2213E+00 | 1.0406E+00 |
| 12 | * | 2.2278E+00 | 2.4745E+00 | 2.6517E+00 | 2.6436E+00 | 2.5211E+00 |
| 11 | * | 4.0970E+00 | 3.4484E+00 | 3.9830E+00 | 4.0465E+00 | 3.9627E+00 |
| 10 | * | 6.3608E+00 | 5.8910E+00 | 5.6406E+00 | 5.4728E+00 | 5.3761E+00 |
| 9 | 1.0043E+01 | 8.5269E+00 | 6.9759E+00 | 6.7715E+00 | 6.7216E+00 | 6.7185E+00 |
| 8 | 1.1329E+01 | 1.0351E+01 | 9.0113E+00 | 7.4637E+00 | 7.9845E+00 | 8.1860E+00 |
| 7 | 1.3260E+01 | 1.2179E+01 | 1.0838E+01 | 8.7772E+00 | 9.5929E+00 | 9.8639E+00 |
| 6 | 1.4587E+01 | 1.3748E+01 | 1.2730E+01 | 1.1380E+01 | 1.1546E+01 | 1.1588E+01 |
| 5 | 1.5635E+01 | 1.5071E+01 | 1.4437E+01 | 1.3886E+01 | 1.3436E+01 | 1.3228E+01 |
| 4 | 1.6484E+01 | 1.6109E+01 | 1.5667E+01 | 1.5245E+01 | 1.4936E+01 | 1.4659E+01 |
| 3 | 1.7160E+01 | 1.6902E+01 | 1.6549E+01 | 1.6152E+01 | 1.6018E+01 | 1.5872E+01 |
| 2 | 1.7668E+01 | 1.7506E+01 | 1.7180E+01 | 1.7170E+01 | 1.7053E+01 | 1.6976E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 7 | 8 | 9 | 10 | 11 | 12 |

| | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|
| 20 | -1.8395E+00 | -1.8296E+00 | -1.8193E+00 | -1.8089E+00 | -1.7992E+00 | -1.7906E+00 |
| 19 | -1.8459E+00 | -1.8373E+00 | -1.8282E+00 | -1.8190E+00 | -1.8104E+00 | -1.8031E+00 |
| 18 | -1.8510E+00 | -1.8431E+00 | -1.8345E+00 | -1.8254E+00 | -1.8167E+00 | -1.8093E+00 |
| 17 | -1.8597E+00 | -1.8531E+00 | -1.8456E+00 | -1.8365E+00 | -1.8274E+00 | -1.8198E+00 |
| 16 | -1.8705E+00 | -1.8668E+00 | -1.8616E+00 | -1.8514E+00 | -1.8408E+00 | -1.8327E+00 |
| 15 | -1.8800E+00 | -1.8800E+00 | -1.8800E+00 | -1.8670E+00 | -1.8548E+00 | -1.8466E+00 |
| 14 | -7.1524E-01 | -9.4648E-01 | -1.2639E+00 | -1.8800E+00 | -1.8652E+00 | -1.8599E+00 |
| 13 | 7.8621E-01 | 3.5240E-01 | -1.4942E-01 | -9.3283E-01 | -1.8800E+00 | -1.8726E+00 |
| 12 | 2.2931E+00 | 1.9298E+00 | 1.4084E+00 | 5.8578E-01 | -5.2469E-01 | -1.8800E+00 |
| 11 | 3.7799E+00 | 3.4870E+00 | 3.0598E+00 | 2.4456E+00 | 1.5819E+00 | 8.4460E-01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | 5.2391E+00 | 5.0226E+00 | 4.7120E+00 | 4.3039E+00 | 3.8289E+00 | 3.4259E+00 |
| 9 | 6.6564E+00 | 6.5164E+00 | 6.3033E+00 | 6.0332E+00 | 5.7419E+00 | 5.4934E+00 |
| 8 | 8.2169E+00 | 8.1458E+00 | 8.0089E+00 | 7.8334E+00 | 7.6489E+00 | 7.4912E+00 |
| 7 | 9.9228E+00 | 9.8842E+00 | 9.7953E+00 | 9.6823E+00 | 9.5665E+00 | 9.4682E+00 |
| 6 | 1.1567E+01 | 1.1512E+01 | 1.1438E+01 | 1.1357E+01 | 1.1278E+01 | 1.1214E+01 |
| 5 | 1.3111E+01 | 1.3027E+01 | 1.2955E+01 | 1.2890E+01 | 1.2834E+01 | 1.2789E+01 |
| 4 | 1.4512E+01 | 1.4421E+01 | 1.4356E+01 | 1.4304E+01 | 1.4264E+01 | 1.4233E+01 |
| 3 | 1.5770E+01 | 1.5701E+01 | 1.5653E+01 | 1.5617E+01 | 1.5590E+01 | 1.5571E+01 |
| 2 | 1.6923E+01 | 1.6887E+01 | 1.6862E+01 | 1.6844E+01 | 1.6831E+01 | 1.6821E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 13 | 14 | 15 | 16 | 17 | 18 |

| | 19 | 20 |
|---|---|---|
| 20 | -1.7833E+00 | -1.7778E+00 |
| 19 | -1.7973E+00 | -1.7916E+00 |
| 18 | -1.8040E+00 | -1.7995E+00 |
| 17 | -1.8146E+00 | -1.8106E+00 |
| 16 | -1.8275E+00 | -1.8240E+00 |
| 15 | -1.8415E+00 | -1.8385E+00 |
| 14 | -1.8557E+00 | -1.8533E+00 |
| 13 | -1.8697E+00 | -1.8684E+00 |
| 12 | -1.8800E+00 | -1.8800E+00 |
| 11 | 5.9615E-01 | 5.3463E-01 |
| 10 | 3.2114E+00 | 3.1463E+00 |
| 9 | 5.3405E+00 | 5.2900E+00 |
| 8 | 7.3891E+00 | 7.3542E+00 |
| 7 | 9.4035E+00 | 9.3810E+00 |
| 6 | 1.1171E+01 | 1.1156E+01 |
| 5 | 1.2761E+01 | 1.2751E+01 |
| 4 | 1.4214E+01 | 1.4207E+01 |
| 3 | 1.5559E+01 | 1.5555E+01 |
| 2 | 1.6816E+01 | 1.6814E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 |
| | 19 | 20 |

************ End of logbook ************

Units of all fluxes in [ft^3/d]

| i | j | flux | CodeID | Node# | |
|---|---|---|---|---|---|
| 14 | 15 | -3348.0591 | 2 | 1 | constant head |
| 15 | 15 | -2273.5835 | 2 | 2 | constant head |
| 9 | 16 | -7390.6245 | 2 | 3 | constant head |
| 4 | 20 | -0.7064 | 2 | 4 | constant head |
| 5 | 19 | -4.8510 | 2 | 5 | constant head |
| 11 | 15 | -7151.9300 | 2 | 6 | constant head |
| 16 | 14 | -4823.2071 | 2 | 7 | constant head |
| 13 | 15 | -3207.9849 | 2 | 8 | constant head |
| 10 | 16 | -2947.3963 | 2 | 9 | constant head |
| 12 | 15 | -3701.6748 | 2 | 10 | constant head |
| 6 | 18 | -8.1854 | 2 | 11 | constant head |
| 11 | 16 | -47.4313 | 2 | 12 | constant head |
| 9 | 17 | -32.2307 | 2 | 13 | constant head |
| 20 | 12 | -3452.1452 | 2 | 14 | constant head |
| 19 | 12 | -7088.7399 | 2 | 15 | constant head |
| 18 | 12 | -12683.7282 | 2 | 16 | constant head |
| 7 | 17 | -4.7471 | 2 | 17 | constant head |
| 8 | 17 | -1841.5092 | 2 | 18 | constant head |
| 17 | 13 | -7474.9548 | 2 | 19 | constant head |
| 2 | 1 | 9703.1500 | 1 | 20 | constant head |
| 3 | 1 | 2632.4217 | 1 | 21 | constant head |
| 4 | 1 | 1545.4190 | 1 | 22 | constant head |
| 5 | 1 | 1094.0913 | 1 | 23 | constant head |
| 6 | 1 | 1071.3254 | 1 | 24 | constant head |
| 7 | 1 | 1385.5274 | 1 | 25 | constant head |
| 8 | 1 | 2058.3669 | 1 | 26 | constant head |
| 9 | 1 | 3391.2509 | 1 | 27 | constant head |
| 10 | 1 | 3435.4149 | 1 | 28 | constant head |
| 11 | 1 | 3908.1050 | 1 | 29 | constant head |
| 12 | 1 | 4221.1392 | 1 | 30 | constant head |
| 13 | 1 | 4434.8462 | 1 | 31 | constant head |
| 14 | 1 | 4579.8549 | 1 | 32 | constant head |
| 15 | 1 | 4680.6969 | 1 | 33 | constant head |
| 16 | 1 | 4753.5481 | 1 | 34 | constant head |
| 17 | 1 | 4807.0045 | 1 | 35 | constant head |
| 18 | 1 | 4844.6325 | 1 | 36 | constant head |
| 19 | 1 | 4867.2835 | 1 | 37 | constant head |
| 20 | 1 | 2437.4854 | 1 | 38 | constant head |
| 20 | 11 | 0.0000 | 3 | 1 | flux node |
| 20 | 10 | 0.0000 | 3 | 2 | flux node |
| 20 | 9 | 0.0000 | 3 | 3 | flux node |
| 20 | 8 | 0.0000 | 3 | 4 | flux node |
| 20 | 7 | 0.0000 | 3 | 5 | flux node |
| 20 | 6 | 0.0000 | 3 | 6 | flux node |
| 20 | 5 | 0.0000 | 3 | 7 | flux node |
| 20 | 4 | 0.0000 | 3 | 8 | flux node |
| 20 | 3 | 0.0000 | 3 | 9 | flux node |
| 20 | 2 | 0.0000 | 3 | 10 | flux node |
| 1 | 1 | -4843.7539 | 10 | 11 | flux node |
| 1 | 2 | -4821.4432 | 10 | 12 | flux node |
| 1 | 3 | -4710.9602 | 10 | 13 | flux node |
| 1 | 4 | -4584.0645 | 10 | 14 | flux node |
| 1 | 5 | -4442.7149 | 10 | 15 | flux node |
| 1 | 6 | -4260.6061 | 10 | 16 | flux node |
| 1 | 7 | -3940.4944 | 10 | 17 | flux node |
| 1 | 8 | -7444.4705 | 10 | 18 | flux node |

| | | | | | |
|---|---|---|---|---|---|
| 9 | 11 | -7949.7596 | 5 | 1 | river node |
| 9 | 2 | -3199.5931 | 5 | 2 | river node |
| 10 | 3 | -2687.7881 | 5 | 3 | river node |
| 11 | 4 | 1126.4467 | 5 | 4 | river node |
| 10 | 5 | 2022.9393 | 5 | 5 | river node |
| 10 | 6 | -6736.8407 | 5 | 6 | river node |
| 10 | 7 | -13779.0103 | 5 | 7 | river node |
| 10 | 8 | -8221.2198 | 5 | 8 | river node |
| 9 | 10 | 1933.0097 | 5 | 9 | river node |
| 8 | 12 | -4038.9339 | 5 | 10 | river node |
| 8 | 14 | 2673.2216 | 5 | 11 | river node |
| 9 | 15 | 5820.2909 | 5 | 12 | river node |
| 9 | 9 | -8436.6812 | 5 | 13 | river node |

Sum of all fluxes organized in Codes :

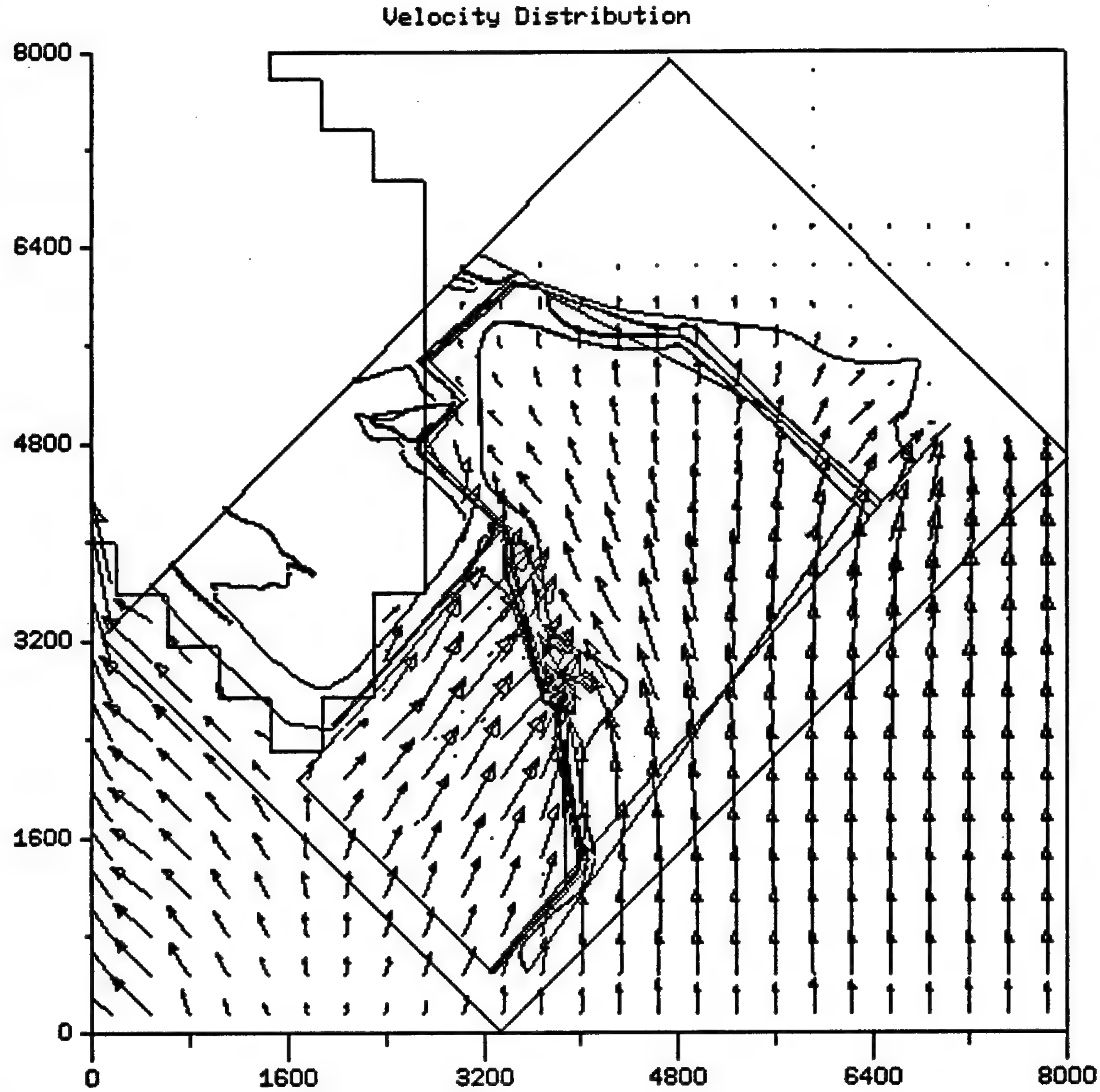
10

| | | | |
|---|---|---|---|
| 1 | 69851.5625 | CodeID | Total flux |
| 2 | -67483.6797 | CodeID | Total flux |
| 3 | 0.0000 | CodeID | Total flux |
| 4 | 0.0000 | CodeID | Total flux |
| 5 | -41473.9180 | CodeID | Total flux |
| 6 | 0.0000 | CodeID | Total flux |
| 7 | 0.0000 | CodeID | Total flux |
| 8 | 0.0000 | CodeID | Total flux |
| 9 | 0.0000 | CodeID | Total flux |
| 10 | -39048.5078 | CodeID | Total flux |

Global water balance [ft^3/d] :

| | |
|---|---|
| 69851.5637 | total IN-flux through const. head nodes |
| -67483.6892 | total OUT-flux through const. head nodes |
| 0.0000 | total IN-flux through flux nodes |
| -39048.5076 | total OUT-flux through flux nodes |
| 13575.9082 | total IN-flux through river nodes |
| -55049.8267 | total OUT-flux through river nodes |
| 0.0000 | total IN-flux through injection wells |
| 0.0000 | total OUT-flux through pumping wells |
| 64673.6850 | total net aquifer recharge |
| -13480.8666 | sum of all fluxes should be zero |
| -4.3531% | total mass balance error |

PSFMOD2H




FLOWPATH

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# Wells:

0

Vmin :

0.00E+00

Vmax :

3.30E+00

Vavg :

7.40E-01

Angle:

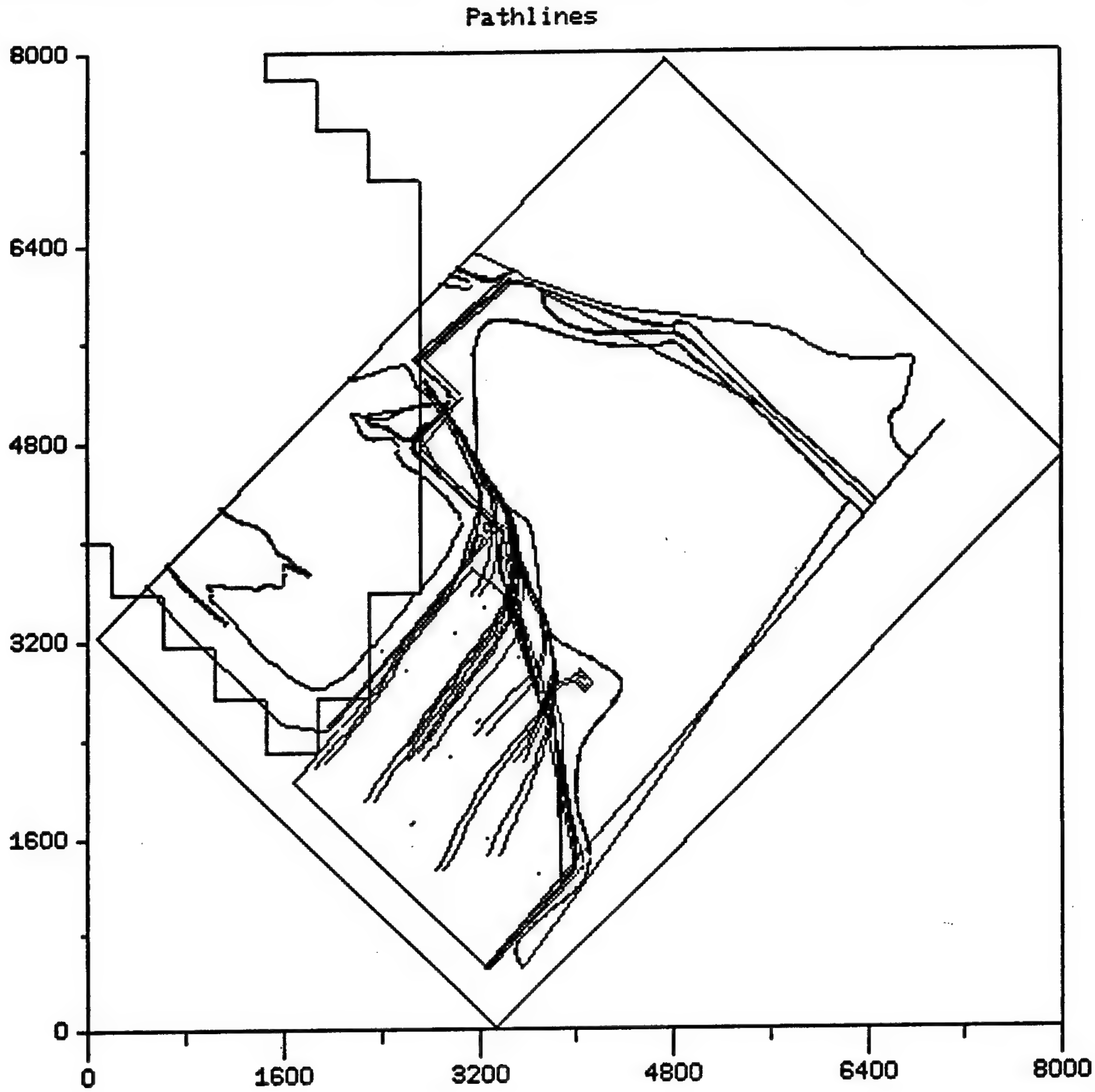
9.04E+01

Units :

[ft]

File :

PSFMOD2H




FLOWPATH

Copyright

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Steady

State

Flow

Time :

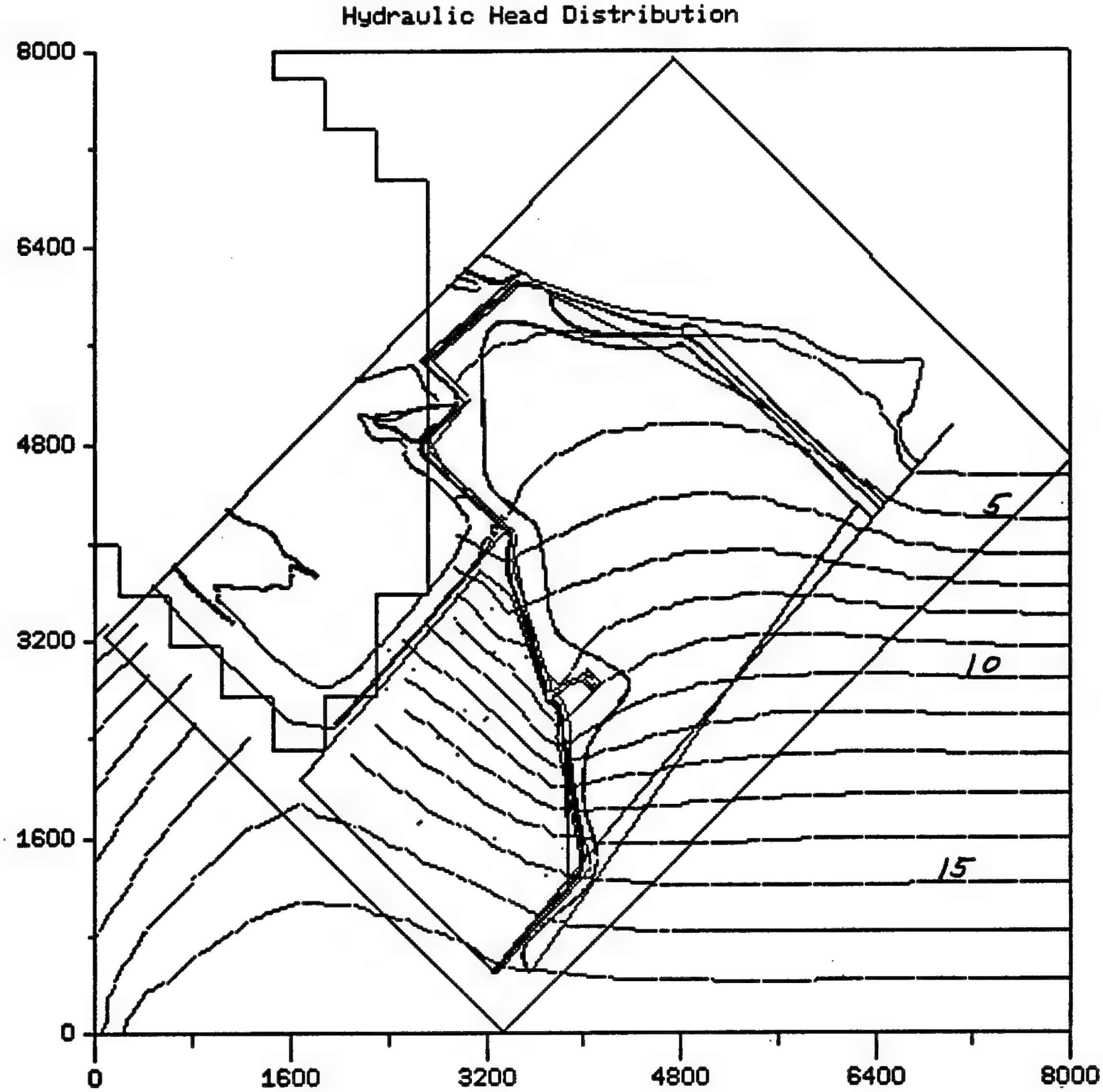
steady

Units :

[ft]

File :

PSFMOD2H




FLOWPATH

Copyright

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Steady

State

Flow

Min :

4.00E+00

Max :

1.80E+01

Inc :

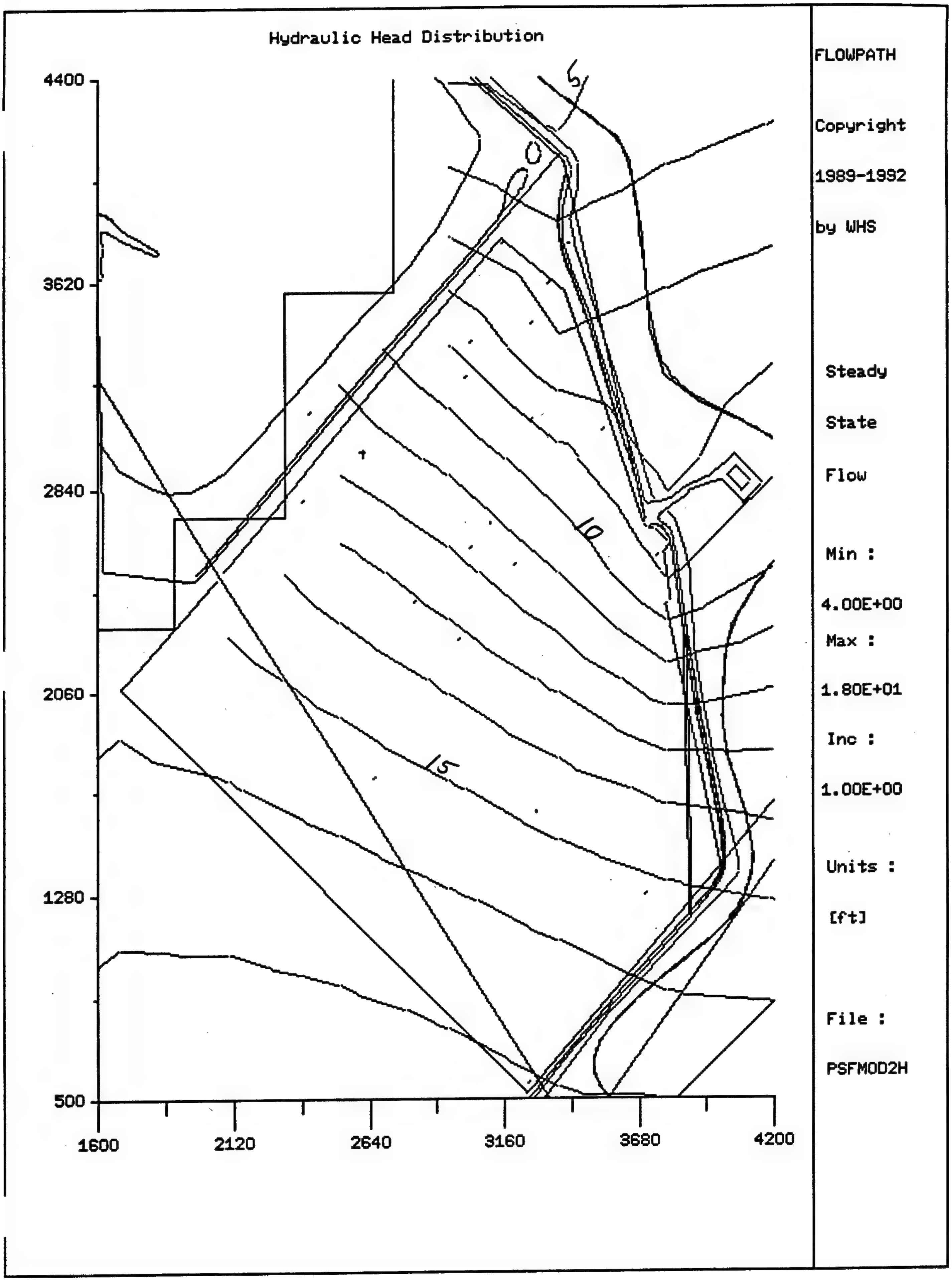
1.00E+00

Units :

[ft]

File :

PSFMOD2H



Hydraulic Head Distribution
4400
3620
2840
2060
1280
500
1600
2120
2640
3160
3680
4200
5
10
15
FLOWPATH
Copyright
1989-1992
by WHS
Steady
State
Flow
Min :
4.00E+00
Max :
1.80E+01
Inc :
1.00E+00
Units :
[ft]
File :
PSFMOD2H

^[S^A
^[C(

```
**************************************************************
*                     E C H O P R I N T                      *
*                                                            *
*                      F L O W P A T H                       *
*                        version 3.0                         *
*                                                            *
*  FLOWPATH was written by Thomas Franz and Nilson Guiguer   *
*                                                            *
**************************************************************
*                                                            *
*                  Copyright 1989, 1992                      *
*                           by                               *
*              Waterloo Hydrogeologic Software               *
*                 200 Candlewood Crescent                    *
*                    Waterloo, Ontario                       *
*                    N2L 5Y9, Canada                         *
*                                                            *
*                    ph (519) 746-1798                       *
*                                                            *
**************************************************************
```

FLOWPATH logbook for data set : PSFMOD2H

Unit System : English units [ft/gal/d]

***** GRID PARAMETERS *****

Number of x-grid lines : 20

Number of y-grid lines : 20

Grid coordinates (x-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 4.21053E+02 |
| 3 | 8.42105E+02 |
| 4 | 1.26316E+03 |
| 5 | 1.68421E+03 |
| 6 | 2.10526E+03 |
| 7 | 2.52632E+03 |
| 8 | 2.94737E+03 |
| 9 | 3.36842E+03 |
| 10 | 3.78947E+03 |
| 11 | 4.21053E+03 |
| 12 | 4.63158E+03 |
| 13 | 5.05263E+03 |
| 14 | 5.47368E+03 |
| 15 | 5.89474E+03 |

| | |
|---|---|
| 16 | 6.31579E+03 |
| 17 | 6.73684E+03 |
| 18 | 7.15789E+03 |
| 19 | 7.57895E+03 |
| 20 | 8.00000E+03 |

Grid coordinates (y-grid lines) [ft] :

| | |
|---|---|
| 1 | 0.00000E+00 |
| 2 | 4.21053E+02 |
| 3 | 8.42105E+02 |
| 4 | 1.26316E+03 |
| 5 | 1.68421E+03 |
| 6 | 2.10526E+03 |
| 7 | 2.52632E+03 |
| 8 | 2.94737E+03 |
| 9 | 3.36842E+03 |
| 10 | 3.78947E+03 |
| 11 | 4.21053E+03 |
| 12 | 4.63158E+03 |
| 13 | 5.05263E+03 |
| 14 | 5.47368E+03 |
| 15 | 5.89474E+03 |
| 16 | 6.31579E+03 |
| 17 | 6.73684E+03 |
| 18 | 7.15789E+03 |
| 19 | 7.57895E+03 |
| 20 | 8.00000E+03 |

***** WELL PARAMETERS *****

Number of wells : 0

***** CONSTRAINED HEAD NODES *****

Number of constant head nodes : 37

| No. | i | j | X [ft] | Y [ft] | const. head [ft] |
|---|---|---|---|---|---|
| 1 | 2 | 1 | 4.24779E+02 | 0.00000E+00 | 1.80000E+01 |
| 2 | 3 | 1 | 8.49558E+02 | 0.00000E+00 | 1.80000E+01 |
| 3 | 4 | 1 | 1.25664E+03 | 0.00000E+00 | 1.80000E+01 |
| 4 | 5 | 1 | 1.68142E+03 | 0.00000E+00 | 1.80000E+01 |
| 5 | 6 | 1 | 2.10619E+03 | 0.00000E+00 | 1.80000E+01 |
| 6 | 7 | 1 | 2.53097E+03 | 0.00000E+00 | 1.80000E+01 |
| 7 | 8 | 1 | 2.95575E+03 | 0.00000E+00 | 1.80000E+01 |
| 8 | 9 | 1 | 3.36283E+03 | 0.00000E+00 | 1.80000E+01 |
| 9 | 10 | 1 | 3.78761E+03 | 0.00000E+00 | 1.80000E+01 |
| 10 | 11 | 1 | 4.21239E+03 | 0.00000E+00 | 1.80000E+01 |
| 11 | 12 | 1 | 4.63717E+03 | 0.00000E+00 | 1.80000E+01 |

| | | | | | |
|---|---|---|---|---|---|
| 12 | 13 | 1 | 5.04425E+03 | 0.00000E+00 | 1.80000E+01 |
| 13 | 14 | 1 | 5.46903E+03 | 0.00000E+00 | 1.80000E+01 |
| 14 | 15 | 1 | 5.89381E+03 | 0.00000E+00 | 1.80000E+01 |
| 15 | 16 | 1 | 6.31858E+03 | 0.00000E+00 | 1.80000E+01 |
| 16 | 17 | 1 | 6.74336E+03 | 0.00000E+00 | 1.80000E+01 |
| 17 | 18 | 1 | 7.15044E+03 | 0.00000E+00 | 1.80000E+01 |
| 18 | 19 | 1 | 7.57522E+03 | 0.00000E+00 | 1.80000E+01 |
| 19 | 20 | 1 | 8.00000E+03 | 0.00000E+00 | 1.80000E+01 |
| 20 | 20 | 12 | 8.00000E+03 | 4.63717E+03 | 3.75000E+00 |
| 21 | 19 | 12 | 7.57522E+03 | 4.63717E+03 | 3.75000E+00 |
| 22 | 18 | 12 | 7.15044E+03 | 4.63717E+03 | 3.75000E+00 |
| 23 | 17 | 12 | 6.74336E+03 | 4.63717E+03 | 3.75000E+00 |
| 24 | 17 | 13 | 6.74336E+03 | 5.04425E+03 | 3.75000E+00 |
| 25 | 17 | 14 | 6.74336E+03 | 5.46903E+03 | 3.75000E+00 |
| 26 | 16 | 14 | 6.31858E+03 | 5.46903E+03 | 3.75000E+00 |
| 27 | 15 | 15 | 5.89381E+03 | 5.89381E+03 | 3.75000E+00 |
| 28 | 14 | 15 | 5.46903E+03 | 5.89381E+03 | 3.75000E+00 |
| 29 | 12 | 15 | 4.63717E+03 | 5.89381E+03 | 3.75000E+00 |
| 30 | 11 | 15 | 4.21239E+03 | 5.89381E+03 | 3.75000E+00 |
| 31 | 10 | 16 | 3.78761E+03 | 6.31858E+03 | 3.75000E+00 |
| 32 | 9 | 16 | 3.36283E+03 | 6.31858E+03 | 3.75000E+00 |
| 33 | 8 | 17 | 2.95575E+03 | 6.74336E+03 | 3.75000E+00 |
| 34 | 7 | 18 | 2.53097E+03 | 7.15044E+03 | 3.75000E+00 |
| 35 | 6 | 19 | 2.10619E+03 | 7.57522E+03 | 3.75000E+00 |
| 36 | 5 | 20 | 1.68142E+03 | 8.00000E+03 | 3.75000E+00 |
| 37 | 13 | 15 | 5.04425E+03 | 5.89381E+03 | 3.75000E+00 |

***** SPECIFIED FLUX NODES *****

Number of flux nodes : 20

| No. | i | j | X [ft] | Y [ft] | nodal flow [ft^3/ft^2/d] |
|---|---|---|---|---|---|
| 1 | 20 | 11 | 8.00000E+03 | 4.21239E+03 | 0.00000E+00 |
| 2 | 20 | 10 | 8.00000E+03 | 3.78761E+03 | 0.00000E+00 |
| 3 | 20 | 9 | 8.00000E+03 | 3.36283E+03 | 0.00000E+00 |
| 4 | 20 | 8 | 8.00000E+03 | 2.95575E+03 | 0.00000E+00 |
| 5 | 20 | 7 | 8.00000E+03 | 2.53097E+03 | 0.00000E+00 |
| 6 | 20 | 6 | 8.00000E+03 | 2.10619E+03 | 0.00000E+00 |
| 7 | 20 | 5 | 8.00000E+03 | 1.68142E+03 | 0.00000E+00 |
| 8 | 20 | 4 | 8.00000E+03 | 1.25664E+03 | 0.00000E+00 |
| 9 | 20 | 3 | 8.00000E+03 | 8.49558E+02 | 0.00000E+00 |
| 10 | 20 | 2 | 8.00000E+03 | 4.24779E+02 | 0.00000E+00 |
| 11 | 1 | 1 | 0.00000E+00 | 0.00000E+00 | -3.36000E+00 |
| 12 | 1 | 2 | 0.00000E+00 | 4.24779E+02 | -3.36000E+00 |
| 13 | 1 | 3 | 0.00000E+00 | 8.49558E+02 | -3.36000E+00 |
| 14 | 1 | 4 | 0.00000E+00 | 1.25664E+03 | -3.36000E+00 |
| 15 | 1 | 5 | 0.00000E+00 | 1.68142E+03 | -3.36000E+00 |
| 16 | 1 | 6 | 0.00000E+00 | 2.10619E+03 | -3.36000E+00 |
| 17 | 1 | 7 | 0.00000E+00 | 2.53097E+03 | -3.36000E+00 |
| 18 | 1 | 8 | 0.00000E+00 | 2.95575E+03 | -3.36000E+00 |
| 19 | 1 | 9 | 0.00000E+00 | 3.36283E+03 | -3.36000E+00 |
| 20 | 1 | 10 | 0.00000E+00 | 3.78761E+03 | -3.36000E+00 |

## ***** SURFACE WATER BODIES *****

Number of surface water body nodes : 13

| No. | i | j | X [ft] | Y [ft] | water table [ft] | bottom elevation [ft] | leakage factor [ft/d] |
|---|---|---|---|---|---|---|---|
| 1 | 9 | 2 | 3.363E+03 | 4.248E+02 | 1.700E+01 | 1.600E+01 | 1.0000E-01 |
| 2 | 10 | 3 | 3.788E+03 | 8.496E+02 | 1.600E+01 | 1.500E+01 | 1.0000E-01 |
| 3 | 11 | 4 | 4.212E+03 | 1.257E+03 | 1.500E+01 | 1.400E+01 | 1.0000E-01 |
| 4 | 10 | 6 | 3.788E+03 | 2.106E+03 | 1.100E+01 | 1.000E+01 | 1.0000E-01 |
| 5 | 10 | 7 | 3.788E+03 | 2.531E+03 | 8.000E+00 | 7.000E+00 | 1.0000E-01 |
| 6 | 10 | 8 | 3.788E+03 | 2.956E+03 | 7.000E+00 | 6.000E+00 | 1.0000E-01 |
| 7 | 9 | 9 | 3.363E+03 | 3.363E+03 | 6.500E+00 | 5.500E+00 | 1.0000E-01 |
| 8 | 9 | 10 | 3.363E+03 | 3.788E+03 | 6.000E+00 | 5.000E+00 | 1.0000E-01 |
| 9 | 9 | 11 | 3.363E+03 | 4.212E+03 | 4.600E+00 | 3.600E+00 | 1.0000E-01 |
| 10 | 8 | 12 | 2.956E+03 | 4.637E+03 | 4.200E+00 | 3.200E+00 | 1.0000E-01 |
| 11 | 9 | 15 | 3.363E+03 | 5.894E+03 | 3.800E+00 | 2.800E+00 | 1.0000E-01 |
| 12 | 8 | 14 | 2.956E+03 | 5.469E+03 | 3.900E+00 | 2.900E+00 | 1.0000E-01 |
| 13 | 8 | 13 | 2.956E+03 | 5.044E+03 | 4.000E+00 | 3.000E+00 | 1.0000E-01 |

## ***** AQUIFER PROPERTIES *****

Number of different material properties : 1

| No. | Kxx [ft/d] | Kyy [ft/d] | Porosity [-] | |
|---|---|---|---|---|
| 1 | 1.50000E+02 | 1.50000E+02 | 3.00000E-01 | (default) |

## ********** DISTRIBUTION OF AQUIFER MATERIAL PROPERTIES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | * | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 1 | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

```
  5 |  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  4 |  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  3 |  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  2 |  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  1 |  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
-------------------------------------------------------------------------
    |  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17


    | 18  19  20
----------------
 20 |  1   1   1
 19 |  1   1   1
 18 |  1   1   1
 17 |  1   1   1
 16 |  1   1   1
 15 |  1   1   1
 14 |  1   1   1
 13 |  1   1   1
 12 |  1   1   1
 11 |  1   1   1
 10 |  1   1   1
  9 |  1   1   1
  8 |  1   1   1
  7 |  1   1   1
  6 |  1   1   1
  5 |  1   1   1
  4 |  1   1   1
  3 |  1   1   1
  2 |  1   1   1
  1 |  1   1   1
----------------
    | 18  19  20
```

***** AQUIFER TYPE *****

Unconfined aquifer

***** AQUIFER BOTTOM ELEVATIONS *****

Number of different aquifer bottom elevations : 3

| No. | aquifer bottom elevation [ft] |
|---|---|
| 1 | -1.00000E+01 (default) |
| 2 | -1.50000E+01 |
| 3 | -2.50000E+01 |

********** DISTRIBUTION OF AQUIFER BOTTOM ELEVATIONS **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 19 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 18 | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 17 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 16 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 13 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 12 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 11 | * | * | * | * | * | * | * | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| 10 | 1 | * | * | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | * | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | * | * | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

| | 18 | 19 | 20 |
|---|---|---|---|
| 20 | 3 | 3 | 3 |
| 19 | 3 | 3 | 3 |
| 18 | 3 | 3 | 3 |
| 17 | 3 | 3 | 3 |
| 16 | 3 | 3 | 3 |
| 15 | 3 | 3 | 3 |
| 14 | 3 | 3 | 3 |
| 13 | 3 | 3 | 3 |
| 12 | 3 | 3 | 3 |
| 11 | 3 | 3 | 3 |
| 10 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 |
| | 18 | 19 | 20 |

***** AREAL RECHARGE *****

Number of different infiltration/evapotranspiration rates : 11

| No. | infiltration [L/T] | evapotranspiration [L/T] | effective recharge [L/T] | |
|---|---|---|---|---|
| 1 | 2.00000E-03 | 0.00000E+00 | 2.00000E-03 | (default) |
| 1 | 3.00000E-04 | 0.00000E+00 | 3.00000E-04 | |
| 1 | 0.00000E+00 | 0.00000E+00 | 0.00000E+00 | |
| 1 | 9.00000E-03 | 0.00000E+00 | 9.00000E-03 | |
| 1 | 2.00000E-03 | 0.00000E+00 | 2.00000E-03 | |
| 1 | 2.00000E-02 | 0.00000E+00 | 2.00000E-02 | |
| 1 | 9.00000E-03 | 0.00000E+00 | 9.00000E-03 | |
| 1 | 9.00000E-03 | 0.00000E+00 | 9.00000E-03 | |
| 1 | 2.00000E-03 | 0.00000E+00 | 2.00000E-03 | |
| 1 | 6.00000E-03 | 0.00000E+00 | 6.00000E-03 | |
| 1 | 3.00000E-04 | 0.00000E+00 | 3.00000E-04 | |

********** DISTRIBUTION OF AREAL IN/OUT-FLUXES **********

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 19 | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 18 | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 17 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 16 | * | * | * | * | * | * | * | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15 | * | * | * | * | * | * | * | 11 | 11 | 11 | 11 | 11 | 3 | 3 | 3 | 3 | 3 |
| 14 | * | * | * | * | * | * | * | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 3 |
| 13 | * | * | * | * | * | * | * | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 12 | * | * | * | * | * | * | * | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 11 | * | * | * | * | * | * | * | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 3 |
| 10 | 10 | * | * | * | * | * | * | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 9 | 10 | 10 | * | * | * | * | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 8 | 10 | 10 | 10 | * | * | * | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 7 | 10 | 10 | 10 | 10 | * | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |

| | 18 | 19 | 20 |
|---|---|---|---|
| 20 | 3 | 3 | 3 |
| 19 | 3 | 3 | 3 |
| 18 | 3 | 3 | 3 |
| 17 | 3 | 3 | 3 |
| 16 | 3 | 3 | 3 |
| 15 | 3 | 3 | 3 |
| 14 | 3 | 3 | 3 |
| 13 | 3 | 3 | 3 |
| 12 | 3 | 3 | 3 |
| 11 | 3 | 3 | 3 |

| | | | |
|---|---|---|---|
| 10 | 11 | 11 | 11 |
| 9 | 11 | 11 | 11 |
| 8 | 11 | 11 | 11 |
| 7 | 11 | 11 | 11 |
| 6 | 11 | 11 | 11 |
| 5 | 11 | 11 | 11 |
| 4 | 11 | 11 | 11 |
| 3 | 11 | 11 | 11 |
| 2 | 11 | 11 | 11 |
| 1 | 11 | 11 | 11 |
| | 18 | 19 | 20 |

***** PATHLINE & PARTICLE TRACKING DATA *****

Number of forward particles : 5

| No. | x-release | y-release |
|---|---|---|
| 1 | 2.63624E+03 | 2.37168E+03 |
| 2 | 2.75920E+03 | 2.37168E+03 |
| 3 | 2.70890E+03 | 2.31579E+03 |
| 4 | 2.75920E+03 | 2.24872E+03 |
| 5 | 2.63624E+03 | 2.24872E+03 |

Number of reverse particles : 0

No well particles specified

************ HYDRAULIC HEAD DISTRIBUTION ************

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 20 | * | * | * | * | 3.7500E+00 | 3.7505E+00 |
| 19 | * | * | * | * | * | 3.7500E+00 |
| 18 | * | * | * | * | * | * |
| 17 | * | * | * | * | * | * |
| 16 | * | * | * | * | * | * |
| 15 | * | * | * | * | * | * |
| 14 | * | * | * | * | * | * |
| 13 | * | * | * | * | * | * |
| 12 | * | * | * | * | * | * |
| 11 | * | * | * | * | * | * |
| 10 | 3.4847E+00 | * | * | * | * | * |
| 9 | 8.4289E+00 | 1.0407E+01 | * | * | * | * |
| 8 | 1.0517E+01 | 1.1889E+01 | 1.3145E+01 | * | * | * |
| 7 | 1.1798E+01 | 1.3005E+01 | 1.4044E+01 | 1.4886E+01 | * | 1.4555E+01 |
| 6 | 1.2739E+01 | 1.3880E+01 | 1.4782E+01 | 1.5424E+01 | 1.5748E+01 | 1.5331E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | 1.3517E+01 | 1.4627E+01 | 1.5447E+01 | 1.5980E+01 | 1.6205E+01 | 1.6049E+01 |
| 4 | 1.4220E+01 | 1.5319E+01 | 1.6083E+01 | 1.6555E+01 | 1.6760E+01 | 1.6716E+01 |
| 3 | 1.4886E+01 | 1.6010E+01 | 1.6712E+01 | 1.7111E+01 | 1.7289E+01 | 1.7291E+01 |
| 2 | 1.5477E+01 | 1.6795E+01 | 1.7350E+01 | 1.7613E+01 | 1.7724E+01 | 1.7735E+01 |
| 1 | 1.5602E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 1 | 2 | 3 | 4 | 5 | 6 |

| | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| 20 | 3.7519E+00 | 3.7543E+00 | 3.7574E+00 | 3.7612E+00 | 3.7654E+00 | 3.7702E+00 |
| 19 | 3.7511E+00 | 3.7531E+00 | 3.7559E+00 | 3.7591E+00 | 3.7628E+00 | 3.7669E+00 |
| 18 | 3.7500E+00 | 3.7518E+00 | 3.7543E+00 | 3.7571E+00 | 3.7605E+00 | 3.7643E+00 |
| 17 | * | 3.7500E+00 | 3.7519E+00 | 3.7538E+00 | 3.7568E+00 | 3.7599E+00 |
| 16 | * | 3.7835E+00 | 3.7500E+00 | 3.7500E+00 | 3.7527E+00 | 3.7545E+00 |
| 15 | * | 3.8505E+00 | 3.8384E+00 | 3.8685E+00 | 3.7500E+00 | 3.7500E+00 |
| 14 | * | 3.9327E+00 | 4.0736E+00 | 4.1807E+00 | 4.2152E+00 | 4.2390E+00 |
| 13 | * | 4.0776E+00 | 4.3749E+00 | 4.6126E+00 | 4.7685E+00 | 4.8496E+00 |
| 12 | * | 4.3825E+00 | 4.7084E+00 | 5.0954E+00 | 5.3613E+00 | 5.5111E+00 |
| 11 | * | 5.4235E+00 | 4.9520E+00 | 5.6624E+00 | 6.0310E+00 | 6.2475E+00 |
| 10 | * | 7.0256E+00 | 6.1836E+00 | 6.6303E+00 | 6.9117E+00 | 7.1744E+00 |
| 9 | 1.0634E+01 | 9.0660E+00 | 7.1110E+00 | 7.4212E+00 | 7.8609E+00 | 8.2542E+00 |
| 8 | 1.1766E+01 | 1.0769E+01 | 9.3057E+00 | 7.6476E+00 | 8.7781E+00 | 9.3847E+00 |
| 7 | 1.3453E+01 | 1.2388E+01 | 1.0999E+01 | 8.8661E+00 | 1.0088E+01 | 1.0682E+01 |
| 6 | 1.4659E+01 | 1.3839E+01 | 1.2799E+01 | 1.1416E+01 | 1.1845E+01 | 1.2136E+01 |
| 5 | 1.5651E+01 | 1.5097E+01 | 1.4435E+01 | 1.3783E+01 | 1.3577E+01 | 1.3578E+01 |
| 4 | 1.6482E+01 | 1.6114E+01 | 1.5665E+01 | 1.5233E+01 | 1.4981E+01 | 1.4874E+01 |
| 3 | 1.7154E+01 | 1.6902E+01 | 1.6550E+01 | 1.6158E+01 | 1.6071E+01 | 1.6006E+01 |
| 2 | 1.7664E+01 | 1.7505E+01 | 1.7182E+01 | 1.7179E+01 | 1.7085E+01 | 1.7040E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 7 | 8 | 9 | 10 | 11 | 12 |

| | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|
| 20 | 3.7754E+00 | 3.7808E+00 | 3.7865E+00 | 3.7921E+00 | 3.7975E+00 | 3.8023E+00 |
| 19 | 3.7713E+00 | 3.7759E+00 | 3.7809E+00 | 3.7858E+00 | 3.7905E+00 | 3.7945E+00 |
| 18 | 3.7682E+00 | 3.7724E+00 | 3.7770E+00 | 3.7818E+00 | 3.7864E+00 | 3.7905E+00 |
| 17 | 3.7630E+00 | 3.7663E+00 | 3.7702E+00 | 3.7749E+00 | 3.7796E+00 | 3.7837E+00 |
| 16 | 3.7561E+00 | 3.7579E+00 | 3.7605E+00 | 3.7656E+00 | 3.7706E+00 | 3.7752E+00 |
| 15 | 3.7500E+00 | 3.7500E+00 | 3.7500E+00 | 3.7562E+00 | 3.7602E+00 | 3.7657E+00 |
| 14 | 4.2219E+00 | 4.1505E+00 | 4.0178E+00 | 3.7500E+00 | 3.7500E+00 | 3.7576E+00 |
| 13 | 4.8415E+00 | 4.7097E+00 | 4.4914E+00 | 4.1255E+00 | 3.7500E+00 | 3.7530E+00 |
| 12 | 5.5442E+00 | 5.4434E+00 | 5.1816E+00 | 4.6512E+00 | 3.7500E+00 | 3.7500E+00 |
| 11 | 6.3362E+00 | 6.2881E+00 | 6.0825E+00 | 5.6778E+00 | 5.1534E+00 | 4.9803E+00 |
| 10 | 7.3315E+00 | 7.3597E+00 | 7.2531E+00 | 7.0100E+00 | 6.6457E+00 | 6.4644E+00 |
| 9 | 8.5044E+00 | 8.6158E+00 | 8.6087E+00 | 8.5088E+00 | 8.3589E+00 | 8.2511E+00 |
| 8 | 9.7181E+00 | 9.8851E+00 | 9.9409E+00 | 9.9228E+00 | 9.8671E+00 | 9.8143E+00 |
| 7 | 1.0998E+01 | 1.1166E+01 | 1.1242E+01 | 1.1261E+01 | 1.1249E+01 | 1.1228E+01 |
| 6 | 1.2326E+01 | 1.2442E+01 | 1.2506E+01 | 1.2533E+01 | 1.2539E+01 | 1.2534E+01 |
| 5 | 1.3632E+01 | 1.3685E+01 | 1.3722E+01 | 1.3744E+01 | 1.3752E+01 | 1.3754E+01 |
| 4 | 1.4855E+01 | 1.4865E+01 | 1.4881E+01 | 1.4893E+01 | 1.4900E+01 | 1.4903E+01 |
| 3 | 1.5979E+01 | 1.5974E+01 | 1.5978E+01 | 1.5983E+01 | 1.5987E+01 | 1.5989E+01 |
| 2 | 1.7021E+01 | 1.7015E+01 | 1.7015E+01 | 1.7017E+01 | 1.7018E+01 | 1.7019E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 | 1.8000E+01 |
| | 13 | 14 | 15 | 16 | 17 | 18 |

| | 19 | 20 |
|---|---|---|
| 20 | 3.8064E+00 | 3.8097E+00 |
| 19 | 3.7978E+00 | 3.8012E+00 |
| 18 | 3.7935E+00 | 3.7961E+00 |
| 17 | 3.7867E+00 | 3.7891E+00 |
| 16 | 3.7785E+00 | 3.7807E+00 |
| 15 | 3.7696E+00 | 3.7716E+00 |
| 14 | 3.7615E+00 | 3.7632E+00 |
| 13 | 3.7547E+00 | 3.7555E+00 |
| 12 | 3.7500E+00 | 3.7500E+00 |
| 11 | 4.9115E+00 | 4.8931E+00 |
| 10 | 6.3822E+00 | 6.3586E+00 |
| 9 | 8.1915E+00 | 8.1728E+00 |
| 8 | 9.7802E+00 | 9.7687E+00 |
| 7 | 1.1212E+01 | 1.1206E+01 |
| 6 | 1.2528E+01 | 1.2526E+01 |
| 5 | 1.3753E+01 | 1.3752E+01 |
| 4 | 1.4903E+01 | 1.4903E+01 |
| 3 | 1.5990E+01 | 1.5990E+01 |
| 2 | 1.7020E+01 | 1.7020E+01 |
| 1 | 1.8000E+01 | 1.8000E+01 |
| | 19 | 20 |

************ End of logbook ************

Units of all fluxes in [ft^3/d]

| i | j | flux | CodeID | Node# | |
|---|---|---|---|---|---|
| 2 | 1 | 9768.1548 | 1 | 1 | constant head |
| 3 | 1 | 2697.6258 | 1 | 2 | constant head |
| 4 | 1 | 1615.2628 | 1 | 3 | constant head |
| 5 | 1 | 1152.0733 | 1 | 4 | constant head |
| 6 | 1 | 1107.6977 | 1 | 5 | constant head |
| 7 | 1 | 1401.4773 | 1 | 6 | constant head |
| 8 | 1 | 2061.2402 | 1 | 7 | constant head |
| 9 | 1 | 3386.2641 | 1 | 8 | constant head |
| 10 | 1 | 3396.2081 | 1 | 9 | constant head |
| 11 | 1 | 3780.7355 | 1 | 10 | constant head |
| 12 | 1 | 3960.3052 | 1 | 11 | constant head |
| 13 | 1 | 4037.7006 | 1 | 12 | constant head |
| 14 | 1 | 4061.9936 | 1 | 13 | constant head |
| 15 | 1 | 4062.7623 | 1 | 14 | constant head |
| 16 | 1 | 4056.2589 | 1 | 15 | constant head |
| 17 | 1 | 4049.7923 | 1 | 16 | constant head |
| 18 | 1 | 4045.5630 | 1 | 17 | constant head |
| 19 | 1 | 4043.4732 | 1 | 18 | constant head |
| 20 | 1 | 2021.4573 | 1 | 19 | constant head |
| 20 | 12 | -2525.1809 | 2 | 20 | constant head |
| 19 | 12 | -5129.6282 | 2 | 21 | constant head |
| 18 | 12 | -5430.7124 | 2 | 22 | constant head |
| 17 | 12 | -9411.1649 | 2 | 23 | constant head |
| 17 | 13 | -1333.5775 | 2 | 24 | constant head |
| 17 | 14 | -76.8740 | 2 | 25 | constant head |
| 16 | 14 | -2508.0170 | 2 | 26 | constant head |
| 15 | 15 | -1232.6933 | 2 | 27 | constant head |
| 14 | 15 | -1773.2557 | 2 | 28 | constant head |
| 12 | 15 | -1744.5288 | 2 | 29 | constant head |
| 11 | 15 | -2164.1008 | 2 | 30 | constant head |
| 10 | 16 | -540.4826 | 2 | 31 | constant head |
| 9 | 16 | -534.9656 | 2 | 32 | constant head |
| 8 | 17 | -160.8671 | 2 | 33 | constant head |
| 7 | 18 | -12.7114 | 2 | 34 | constant head |
| 6 | 19 | -6.8977 | 2 | 35 | constant head |
| 5 | 20 | -0.9987 | 2 | 36 | constant head |
| 13 | 15 | -1690.3852 | 2 | 37 | constant head |
| 20 | 11 | 0.0000 | 3 | 1 | flux node |
| 20 | 10 | 0.0000 | 3 | 2 | flux node |
| 20 | 9 | 0.0000 | 3 | 3 | flux node |
| 20 | 8 | 0.0000 | 3 | 4 | flux node |
| 20 | 7 | 0.0000 | 3 | 5 | flux node |
| 20 | 6 | 0.0000 | 3 | 6 | flux node |
| 20 | 5 | 0.0000 | 3 | 7 | flux node |
| 20 | 4 | 0.0000 | 3 | 8 | flux node |
| 20 | 3 | 0.0000 | 3 | 9 | flux node |
| 20 | 2 | 0.0000 | 3 | 10 | flux node |
| 1 | 1 | -4842.5864 | 4 | 11 | flux node |
| 1 | 2 | -4818.9830 | 4 | 12 | flux node |
| 1 | 3 | -4707.2374 | 4 | 13 | flux node |
| 1 | 4 | -4581.2028 | 4 | 14 | flux node |
| 1 | 5 | -4448.2346 | 4 | 15 | flux node |
| 1 | 6 | -4301.0039 | 4 | 16 | flux node |
| 1 | 7 | -4123.1072 | 4 | 17 | flux node |
| 1 | 8 | -3880.8128 | 4 | 18 | flux node |
| 1 | 9 | -3485.8239 | 4 | 19 | flux node |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 10 | -6376.5974 | 4 | 20 | flux node |
| 9 | 2 | -3221.2841 | 5 | 1 | river node |
| 10 | 3 | -2798.2878 | 5 | 2 | river node |
| 11 | 4 | 335.7101 | 5 | 3 | river node |
| 10 | 6 | -7368.3589 | 5 | 4 | river node |
| 10 | 7 | -15354.3489 | 5 | 5 | river node |
| 10 | 8 | -11481.0331 | 5 | 6 | river node |
| 9 | 9 | -10832.1183 | 5 | 7 | river node |
| 9 | 10 | -3254.8448 | 5 | 8 | river node |
| 9 | 11 | -6239.9533 | 5 | 9 | river node |
| 8 | 12 | -3235.8778 | 5 | 10 | river node |
| 9 | 15 | -681.1816 | 5 | 11 | river node |
| 8 | 14 | -579.7678 | 5 | 12 | river node |
| 8 | 13 | -1376.5416 | 5 | 13 | river node |

Sum of all fluxes organized in Codes :

5

| | | | |
|---|---|---|---|
| 1 | 64706.0430 | CodeID | Total flux |
| 2 | -36277.0469 | CodeID | Total flux |
| 3 | 0.0000 | CodeID | Total flux |
| 4 | -45565.5898 | CodeID | Total flux |
| 5 | -66087.8828 | CodeID | Total flux |

Global water balance [ft^3/d] :

| | |
|---|---|
| 64706.0461 | total IN-flux through const. head nodes |
| -36277.0419 | total OUT-flux through const. head nodes |
| 0.0000 | total IN-flux through flux nodes |
| -45565.5893 | total OUT-flux through flux nodes |
| 335.7101 | total IN-flux through river nodes |
| -66423.5979 | total OUT-flux through river nodes |
| 0.0000 | total IN-flux through injection wells |
| 0.0000 | total OUT-flux through pumping wells |
| 69832.6878 | total net aquifer recharge |
| -13391.7852 | sum of all fluxes should be zero |
| -4.7297% | total mass balance error |